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THE
ASIATIC SOCIETY OF BOMBAY
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Indian Plague Commission, 1898-99.

MINUTES OF EVIDENCE

TAKEN BY THE

INDIAN PLAGUE COMMISSION

WITH

APPENDICES.

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VOL. II.

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EVIDENCE TAKEN FROM 11TH JANUARY 1899 TO 8TH FEBRUARY 1899.

Presented to both Houses of Parliament by Command of Her Majesty.

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PROCEEDINGS

OF

THE INDIAN PLAGUE COMMISSION.

VOLUME II.

EVIDENCE FROM 11TH JANUARY 1899 TO 8TH FEBRUARY 1899.

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MINUTES OF EVIDENCE

TAKEN BEFORE THE

INDIAN PLAGUE COMMISSION.

NOTE.—Each witness, as far as was possible, put in a précis of the evidence he was prepared to give. The précis, when available, was printed, and copies of it were distributed to the Members of the Commission prior to each witness' examination. The précis does not form a part of this record of the Commission's Proceedings, but is referred to in the questions put to witnesses in examination.

At The Metcalfe Hall, Agra.

TWENTY-FIFTH DAY.

Wednesday, 11th January, 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Professor A. E. WRIGHT, M.D.
Mr. A. CUMINE.
Dr. M. A. RUFFER.
Mr. C. J. HALLIFAX (*Secretary*).

Mr. E. H. HANKIN, called and examined.

Mr. E. H. Hankin.
11 Jan. 1899.

8505. (*The President.*) I understand you are a Fellow of St. John's, Cambridge, are you not?—Late Fellow of St. John's College, Cambridge.

8506. What office do you now hold?—The office of Chemical Examiner and Bacteriologist in the North-West Provinces and Oudh.

8507. You have made a great many laboratory experiments, and have had considerable opportunities of examining plague in Bombay?—Yes, and also during the Hardwar, Kankhal, and Jawalapur outbreaks.

8508. In the first place, in regard to your laboratory experiments, you have endeavoured to find the plague bacillus outside of patients?—Yes.

8509. In what situations?—I have made a very prolonged search for the plague microbe in all sorts of substances that might be suspected to be infected, in mud from infected areas, in suspected water, in suspected clothes, food, dirt from drains, a tobacco pipe, human dejecta, dust from the floor of houses, and earth from the seashore in infected villages. I have even examined the intestines of a prawn—which, of course, feeds on filth—caught just outside an infected village. I have made the very widest search.

8510. And the difficulties, I suppose, are considerable?—Obviously, in that, after several months' work, I only discovered the microbe, that I believe to have been that of plague, in one single case. That was in some salt water in a pond near the village of Sewri. In this case I carried out sufficient experiments with the microbe isolated, and was able to come to the conclusion that it was certainly that of plague; but this was quite an exceptional success.

8511. That was the only success in all the searchings that you made?—Yes.

8512. Can you tell us what articles you examined for the bacillus, and how many experiments you made?—I daresay there were many hundreds. I remember discussing it with Professor Koch when he was there, and he said it was not necessary for his Commission to do a similar thing, as I had done so much in that way, and as I had done so much to disprove the assertion of Yersin that the microbe can be easily found in the mud of infected places.

8513. Among these were there many substances or articles which you knew to have been infected?—I had grounds for such suspicion. May I tell you an instance, as illustrating the difficulties of the search? Some mud was sent to me, taken from a drain near a latrine in Kankhal. From some theoretical considerations it was supposed that it had possibly been infected with plague, and that the plague microbe might have remained latent in the drain for some months. It was a supposition put forward to explain the outbreak in Kankhal so long after the importation of the infection, and I do not know whether the administrative officers now hold it. However, there was some good reason for suspecting that the mud was infected. I injected different quantities of this mud into eight rats. Of these eight rats, three died; and of these that died no trace of plague could be found in any of them by microscopical examination. But from one of these rats I isolated, by culture, a microbe, as a single colony, which on microscopical examination appeared to be very suspicious of plague. I thought it worth while to investigate the microbe further. I injected it into two mice. Both of them died, and their *post mortem* appearance was completely typical of plague, so far as you can use the word typical. Their organs were crowded with bacilli, which, on appropriate treatment by Gaffky's method, showed the polar staining exactly as do plague microbes under similar

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conditions. The unstained area of the microbe was irregularly placed and not always absolutely central, as occurs in plague, and so on. They were present in those countless numbers that you so frequently find in plague cases among animals, and in all respects their appearance was exactly like plague. I think that a hasty observer might well have assumed that he was dealing with plague in such a case, considering the origin of the substance I was investigating. Luckily I continued the research, and examined the mice further. At length I made the discovery that I was dealing with a microbe which was not like a plague microbe under ordinary conditions, but which microbe had the property of acquiring the appearance of the plague microbe when cultivated in the serum of a rat. By cultivating this microbe (which resembled the virus danyz) in the serum of the rat, I found that it swelled up, that it acquired the polar staining, and resembled completely the plague microbe in morphological characters. But, by further tests, I found that this microbe had nothing whatever to do with plague.

8514. The morphological characters are not trustworthy?—Obviously; the above is a striking illustration.

8515. What do you trust to in order to make yourself certain that you are dealing with the true microbe?—In identifying plague cultures, according to my experience, it is never safe to rely upon any single test. I do not think I know of a single test for the plague microbe that it may not refuse to give under certain conditions. For instance, take the case of the stalactite growth in bouillon, which has been, no doubt, shown to you by Professor Haffkine. At the commencement of the Jawalapur outbreak, the plague microbes isolated from patients, from monkeys, and from rats exhibited, when cultivated in bouillon, this stalactitic growth: but towards the end of the plague outbreak in Jawalapur, plague microbes, then isolated, appeared to have lost the power of producing this characteristic growth. There was a change in their specific gravity apparently, and, when grown in bouillon, they were so very heavy that they rapidly sank to the bottom, so that the stalactites were either not developed or were only very imperfectly formed.

8516. Was there any floating material in this bouillon?—I added small particles of fat, as Haffkine did. For the same reason, owing to the change of the specific gravity, I found that this microbe refused to give the Pfeiffer's serum reaction for plague. I found if one made an emulsion of the culture of this microbe in bouillon, that the emulsion rapidly clarified itself, that the microbes stuck together, and settled to the bottom, and that this agglutination could be prevented by the addition of a small quantity of Pfeiffer's anti-plague serum, and also by other sera.

8517. That showed how fallacies might easily arise?—Yes. May I point out another test for a microbe that it may refuse to give, that is my own test, by cultivation of the microbe on agaragar containing three per cent. of salt, under which conditions involution forms are made within 24 hours. It has been found by Professor Haffkine that when the microbes have been kept for a long time in the laboratory they lose the power of giving these very peculiar involution forms. My own experience, to a certain extent, confirms this, but curiously, when I published this method, Professors Pfeiffer and Dieudonné, of the German Plague Commission, wrote to me and informed me that they had repeated my tests and obtained the results I had described. They must have worked with cultures that had been kept for a considerable time in the laboratory: so it is evident in one laboratory the microbe can lose the power of making involution forms, and in another retain it; evidently the difference depends on some detail of culture methods which, hitherto, has not been discovered.

8518. In both instances, they were actually plague microbes?—Undoubtedly in both these cases.

8519. Can you tell us anything about the toxic power of the microbe in these two conditions, in the normal condition and in the abnormal condition that you have last spoken of?—At the end of the Jawalapur outbreak I found that the plague microbe then isolated was not always infective for rats unless you gave a very large dose, whereas the fully virulent Bombay microbe given in minimum doses always produced infection in rats. Cultures on salt agar containing involution forms are as virulent as fresh cultures on ordinary agar.

8520. Have you any observations to show that the less virulent form of microbe can be changed again into the more virulent form?—Yes. By making passages of the attenuated plague microbe through mice, it will gradually regain its virulence for these animals, but I found that if you made passages of virulent plague microbes through rats, it becomes completely attenuated. The latter was a most unexpected observation.

8521. Can the microbe be made to recover its virulence after being attenuated?—Yes; by passages through mice; by rats it is attenuated.

8522. I think you have made some experiments in which you actually put the bacillus into mud, in order to see whether you could again find the bacillus in that mud?—It it very difficult for me to summarise these experiments, but, in the end, I have come to this conclusion, that if you put the bacillus into mud, and if you have got various reasons for expecting that it is still alive in the mud, if you inject small quantities of this infected mud into rats or mice, in many cases they remain in good health, and in many other cases they die at varying intervals without it being possible, in many cases, to detect a trace of the plague microbe in their tissues or organs.

8523. They might have died from some other toxine?—If the mud was not sterilised the animal might have died owing to some other microbe than plague, but the above statements are also true for sterilized mud. In certain experiments I have found that mud and other things which are known to stimulate the activity of the phagocytes, can prevent the infection of plague in rats.

8524. You have made many observations on rats, I think, have you not?—Yes. To illustrate my previous answer I may quote the following experiment. I took a plague microbe and inoculated it into three mice as controls. They all died of plague. Three other mice were inoculated with the same plague microbes, but mixed with a small quantity of sterilised mud. These three mice remained in good health. Evidently the presence of mud had prevented infection in this case. In another case a control rat was inoculated and died of plague, as proved by cultures, and so on; whereas I found in the case of another rat, inoculated with the same plague and with a small quantity of the serum of a rat subcutaneously, that it remained all right.

8525. The serum of a normal rat?—The serum of a normal rat. It recalls certain similar experiments accepted and published in the case of anthrax some years ago, in which it was found that the rat serum could, under certain conditions, prevent the development of anthrax. The explanation tended to show that the reason of it was simply that the serum, to a certain extent, stimulated the activity of the phagocytes to attack the microbes.

8526. You have no experiments to show that it is not a bactericidal action, have you?—I think I published experiments showing that some bactericidal action seemed to take place there, but I do not think, as far as I can recollect, that the activity of phagocytes was completely excluded, or the activity of the cells that secrete alexins.

8527. You have made some experiments, also, on monkeys?—I have not experimented on monkeys, but I have examined the organs of monkeys that have died of plague. One case was particularly interesting, and, I think, sufficiently so for me to bring it to your notice. A monkey was brought to me which had just died, apparently of plague. The *post mortem* appearances were perfectly typical of plague, but on microscopic observation no trace of the plague microbe was to be found in any organ of its body. But on making cultures from the organs I got abundant cultures of plague from every single organ, that is to say, the microbe was there though I could not see it. The curious thing was that the cultures were just as rich as though I had inoculated them from organs in which the microbe was abundantly visible. That is a most surprising result. Naturally I subjected these cultures to very minute tests, in order to be certain that it was the plague microbe. I found that the plague microbe was present, apparently in visible form, in the nasal secretion of this monkey. I proved its presence in this secretion, which was very abundant, by experiments on rats.

8528. In what organs did you find it?—I found it by culture in all the organs, but microscopically it was not to be seen in any of the organs. A microbe that might have been that of plague was visible in the nasal secretion, but microscopic examination is not sufficient to identify it under those conditions. I inoculated that nasal secretion into the nose of a rat, and this animal died of plague.

8529. Could your first-mentioned result possibly be explained by the number being so small as not to be found in a microscopic field, but still sufficiently numerous to produce a colony culture?—One must admit that possibility, but, as I say, the culture obtained from the organs were so rich and abundant that I should not have expected to have got more abundant cultures had I inoculated my agaragar from the organs of a monkey in which the microbes were clearly visible. In a case from Jawalapur, of a child named Gafuran, aged 10, who died on the 4th March, no microbes were visible on microscopic examination, but the plague microbe was obtained in pure culture from the organs. I tested it carefully and found it was virulent to rats when inoculated in traces subcutaneously.

8530. Have you experimented on any other animals that might convey plague—bugs or fleas, for instance?—I obtained some of these creatures from the Infectious Diseases Hospital, Bombay, and ground up 24, and inoculated into four rats. One or two of these animals died of plague. In one or two instances I have found ants to be infected. I have never found fleas to be infected.

8531. Only bugs and ants? — Yes, and only ants which obviously had been feeding on rats which had died of plague. I remember a rat dead of plague being brought into the laboratory, and I noticed that about a quarter of it had been eaten and removed by ants during the night. I remember that Professor Koch saw it, and suggested the advisability of finding out whether this action of ants on rats dead of plague was not a danger and capable of spreading the infection.

8532. Have you made experiments with mosquitoes?—No.

8533. You have made experiments with certain articles of food—grain especially?—With regard to articles of that sort, I found that the grain which I infected with the plague microbe lost its virulence for mice after the lapse of some days. After the lapse of six days the grain that I had infected was no longer virulent for mice, but I have great hesitation in laying any weight on these experiments. As a brief illustration of my reasons for hesitation I can quote the case of a particular culture that I gave to the German Plague Commission. This was a culture of mine that had spontaneously become so attenuated that it no longer killed even mice. The German Plague Commission found that this was the case and then attempted to usé it as a vaccine. They expected that it would be a safe living vaccine when tried on the naturally more resistant monkey. They were interested to have it, as they themselves had not succeeded in attenuating the microbe. They injected my microbe into the monkey, and found that it was capable of killing monkeys, although, as stated, it was harmless to mice. Again an extremely unexpected result. In view of this experiment it is conceivable that grain that had become harmless to mice might still contain a bacillus capable of killing monkeys if administered in suitable quantity.

8534. With regard to the grain that you examined, was that sound or unsound?—I have experimented both with sound and unsound grain with the same results. No evidence could be obtained of the persistence of the vitality of the microbe for more than a few days.

8535. What was the nature of that evidence?—For a few days after this grain was infected it was found to be virulent for mice, but after a longer interval it was no longer virulent for these animals, and as the hostile influence of desiccation, &c. persisted, it may be inferred that the microbe became extinct in the grain after a somewhat longer interval.

8536. And the interval was the same in the case of sound as of unsound grain?—There were certain cases in which the grain was rotten, and there, of course, the acid reaction had developed owing to the fermentation of the carbo-hydrates, and hence we may believe that the microbe perished still more quickly; but I may again point out that no reliable method yet is known for testing the vitality of the microbe under these conditions.

8537. Have you examined clothes in regard to their infectivity?—There I found such extremely irregular results that I could not make any statement whatever as to the period of apparent vitality of the microbe in clothing. For instance, I infected some cloth with plague. An hour later I placed a small piece of this cloth under the skin of a mouse. The animal remained unaffected. Whereas, on the following day, when I injected a little piece of the same cloth into another mouse it died of the plague. The results were most irregular and paradoxical, and the long and the short of it is that we do not yet possess a method of isolating or identifying the microbe when it is present in such articles as clothing, or mud, or cowdung.

8538. Identifying with certainty? — Or even with probability, I believe.

8539. But you did succeed in some cases? — In one case only, which I regard as a lucky accident. A real method does not exist. I did some experiments in repeating Colonel Lawrie's work on the subject. According to a newspaper report I read that he had succeeded in isolating the microbe from mud floors by putting a small quantity of this mud into milk and on the following day examining the milk with a microscope, and that he thus found it to contain in every field of view one or two microbes which he identified as plague microbes. I thought it worth while to repeat that experiment with mud from places where there was no plague. I discovered that in this mud, which was certainly not infected, after mixing with milk, microbes could thus be found which resembled very closely the plague microbe in their microscopic characters; naturally these were perfectly harmless microbes.

8540. Did you make any experiments on animals with these microbes?—It so happens that I did make one or two experiments.

8541. What did you find? — That these microbes were harmless to animals, that is to say, they were not plague microbes.

8542. There was no chance of their being attenuated?—I am talking of mud from non-infected localities as showing that you can find microbes which optically resemble the plague microbes in localities where no plague exists.

8543. You have also, I think, examined food articles other than grain?—Those were some experiments carried out with Dr. Srinivasa Rau. You have probably had an account of them, and it is a fact that the very great majority of articles of food have an acid re-action. My experiments shewed that an acid re-action was, as a rule, hostile to the life of the plague microbe, and should render one sceptical as to food being a frequent source of infection.

8544. In the course of these experiments you examined milk, did you not?—We found that the microbe rapidly died out in milk in which decomposition had so far advanced that there was an acid re-action, that is to say, in milk as you generally have it as an article of diet in India, where it always has an acid reaction when it comes into use.

8545. Within what interval of time after the milk had been milked?—In a very few hours.

8546. Have you made experiments with milk which had been boiled and then been infected?—I found the microbe could live in milk of an alkaline or amphotene reaction.

8547. And it could live how long?—Two or three days, at least.

8548. The difference was very striking?—Oh yes, very.

8549. In regard to water, did you make any experiments?—So far as my experiments go, they tended to show that the microbe did not remain alive very long in water.

8550. Did you make any experiments with fat substance, ghee or butter?—No, I do not think I did directly with ghee or butter.

8551. You have made many experiments with antiseptics; could you give us some account of these experiments?—I found that the plague microbe was very resistant to the action of alkalies, such as quicklime, and that it is very sensitive to the actions of acids, above all, sulphuric acid. A strength of 1 in 1,400 of this acid was sufficient to destroy it within five minutes. It is a general rule as regards the action of

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antiseptics that antiseptics are more efficient in an acid medium. In other words, the activity of antiseptics is increased if they are allowed to act on microbes in an acid medium. This fact suggests that acidified solutions of disinfectants should be used in combating plague. I also discovered that the microbe was very resistant to certain reducing agents and extremely sensitive to the action of certain oxydising agents.

8552. Have you any printed statements in which your experiments are described?—Yes; there is a blue book of mine published by the Bombay Government. That gives a full account of my experiments with disinfectants. The account is given in two letters addressed by me to the Surgeon-General with the Government of Bombay. The first letter, which was sent from Hardwar on the 28th of June 1897, is as follows:—

"SIR,—I have the honour to submit the following report on the action of disinfectants on the microbe of bubonic plague.

"2. Generally speaking, two chief methods of testing the action of disinfectants are in use. In the first the microbe is mixed with a solution of the antiseptic of known strength, and after a definite interval a small quantity of the mixture is injected into an animal susceptible to the microbe employed. If the microbe is still alive, it reproduces and causes the death of the animal. If the microbe has been killed by the disinfectant the animal will remain in good health. Although this method has been found useful in the case of certain spore-forming microbes, it is not of general applicability, in that it is possible that the microbe might become attenuated by the action of the antiseptic, and thus incapable of killing the animal employed. In the other method the mixture of the microbe with the disinfectant is inoculated into sterilised food media. If the medium remains sterile, it is concluded that the microbe has been killed by the disinfectant. Except in one or two experiments I have used this method. In carrying it out, it was first necessary to obtain a series of solutions of the antiseptic of known and increasing strengths. Especially in the case of the weaker disinfectants it was always possible that foreign and resistant microbes might be present, and hence before commencing the experiment it was necessary to sterilise these solutions. In the case of non-volatile disinfectants this could easily be done by placing the solutions in test tubes plugged with cotton wool and sterilising them under steam pressure in the autoclave. In the case of volatile disinfectants, on the other hand, a more complicated procedure was necessary. A series of test tubes each containing exactly 5 cubic centimetres of water was prepared and sterilised. A strong solution of the antiseptic of known strength was then prepared, hermetically sealed up in a tube and sterilised in the autoclave. It was then opened under aseptic precautions, and measured quantities were taken out by means of a sterilised pipette and placed in the test tubes of water. It was then necessary to add the bubonic microbe to these solutions. My previous work on the fate of the bubonic microbe in grains and other articles of export had shown me that this microbe is almost equally resistant whether obtained from solid or liquid cultures or from the organs of animals dead of the disease. If there is any difference it is the microbe existing in agaragar cultures that is the more resistant. Consequently, in all my experiments I have employed emulsions of well-grown agaragar cultures. Five cubic centimetres of sterilised water were poured into the test tube containing the culture under suitable precautions. By means of a glass bristle the film of growth was well rubbed up in the liquid until a fairly homogeneous emulsion was produced. Usually four drops of this emulsion were added to each of the tubes containing the disinfectant solutions. After from five to ten minutes a measured quantity of the mixture of microbes and disinfectant was removed by means of a capillary pipette and placed in a tube of gelatine. In my earlier experiments I used bouillon for this purpose. In the case of other microbes bouillon would give perfectly reliable results. I am indebted to the members of the German Plague Commission, however, for information as to a source of error that would occur with the bubonic microbe if bouillon is used. The bubonic microbe will only grow in cultures in the presence of free oxygen. If inoculated in traces into bouillon after being subjected to the action of antiseptics, there is the possibility of its falling to the bottom of the tube where the supply of oxygen is insufficient, and hence of its refusing to grow. To avoid this risk the German Commission worked with gelatine plate cultures which after inoculation were kept in an ice box. I found it more convenient to employ test tubes containing small quantities of nutrient gelatine. After inoculation these tubes were kept at the room temperature lying in an oblique position so that the gelatine was in a thin layer. As different specimens of gelatine do not always show the same power of supporting the life of the bubonic microbe, I usually took the precaution of inoculating each mixture of the microbe and disinfectant into two tubes containing nutrient gelatine of different strengths. If the control tube in one set of tubes did not grow well, that of the other series was almost certain to be normal and the results of that series were recorded. The control tube, it may be explained, was a tube containing sterilised water to which no antiseptic had been added. It was inoculated with the emulsion of the microbe at the same time as the other tubes, and similarly the microbes it contained were further inoculated into gelatine.

"In the case of growth resulting in the gelatine tubes, a most important part of the experiment was to obtain a proof that this growth was that of the bubonic microbe and not of some other microbe. The growth in gelatine, as in bouillon, is in some cases somewhat characteristic. After 24 to 48 hours, if the tube has been inoculated with only a trace of the microbe, a few light floculi may be seen sticking to the side of the tube. If the tube is moved so that the liquid it contains is disturbed, it is seen that these floculi are readily detached and broken up into the liquid. If the tube is slightly shaken the floculi may be completely broken up and suspended in the liquid, which may then appear perfectly transparent as if no growth was present. So delicate are these floculi and so easily broken up, that simply roughly picking up the tube may, owing to the consequent shaking, make the growth nearly or completely invisible. Hence it is necessary to keep the tubes for at least a week in order to be certain that no growth is present. At the end of this time the growth will be so copious that there is no risk of overlooking it, but its appearance cannot be regarded as sufficiently characteristic. For this reason, in every case I have inoculated the gelatine on to agaragar in order to learn whether or not a pure culture of the bubonic microbe was present.

"A somewhat unexpected source of error here presented itself. When inoculated on to agaragar the bubonic microbe produces a culture that is distinguishable after it has grown for three or four days from that of most other microbes by the practised eye. The parts of the culture inoculated with a small quantity of material contain numerous minute not readily confluent colonies. Near the bottom of the tube where a larger quantity of material was deposited by the inoculating needle, the agaragar is covered with a continuous growth whose appearance has been described by Kitasato as resembling ground glass. In certain cases, and especially if the tube has been inoculated from the organs of animals dead of plague, the growth may be local. For instance, if the inoculating needle has been moved in a zigzag track over the surface of the agar, growth may only ensue at or near the turns of the zigzag, or the growth may be limited to the commencement of the track. Apparently the microbe in such cases only grows where it has been deposited in a quantity or in a layer on the surface of the agaragar. When the microbe of plague is inoculated from 20 per cent. gelatine on to agaragar, it grows readily over the whole surface of the track of the needle. The growth has the typical "ground glass" appearance. It happened, however, in my experiments that certain other microbes, that occasionally occur as impurities, when inoculated from 20 per cent. gelatine on to agaragar, instead of acquiring their ordinary cultural characters, form a growth possessing a ground glass appearance extremely difficult to distinguish from that of the bubonic microbe. Hence in experiments on the action of disinfectants on this microbe, the appearance of the agar culture cannot be relied on to prove that a pure culture was present. It is necessary to examine the culture microscopically after sufficient time has elapsed to permit the development of involution forms. This may involve a delay of a week or more before a conclusion can be arrived at as to the purity of the culture. To obviate this necessity, I have in certain cases made use of a test for the microbe that I discovered some time ago. If the microbe is grown in agaragar containing three or four per cent. salt, the involution forms develop extremely rapidly. In favourable cases they may be found in numbers 24 hours after the culture has been inoculated. A rather large quantity of material should

be employed for inoculating the culture. It is not possible to give a definite figure as to the amount of salt necessary as it appears to vary in different cases. The involution forms at first formed appear as spheres, sausage, or lemon-shaped objects larger than are usually found in on ordinary agaragar cultures. Surgeon-Captain James, who has been working in my laboratory in Bombay, has tried this method on bubonic microbes of many different origins and has found them in every case to give this peculiar reaction. Surgeon-Captain Thomson has repeated this work and is at present investigating the technique most favourable for producing the effect.

"In the following description of my experiments, I have in every case mentioned the occurrence of impurities where such were found. As I was working in a small draughty and overcrowded laboratory the avoidance of impurities was a matter of some difficulty.

"3. *Action of the Phenols and their allies on the Bubonic Microbe.*—The following experiment illustrates the action of carbolic acid on the bubonic microbe. As above described tubes containing solutions of carbolic acid of different strengths were inoculated with measured quantities of the microbe, and after five to ten minutes the mixture of microbes and disinfectant was inoculated further into gelatine. In this experiment each disinfectant solution was inoculated into four tubes. Of these, two contained 2 per cent. gelatine, and the other two gelatine of 20 per cent. One set of tubes was kept at air temperature (about 32 Cent.). The other set was kept in an ice box whose temperature was about 10 degrees lower. The results obtained were as follows:—

Per cent. of Disinfectant.	Kept at Air Temperature.		Kept in Ice Box.	
	After 5 minutes inoculated into 2 per cent. gelatine.	After 20 minutes inoculated into 20 per cent. gelatine.	After 5 minutes inoculated into 2 per cent. gelatine.	After 20 minutes inoculated into 20 per cent. gelatine.
0 control -	†	†	†	†
·5 -	†	†	†	†
1 -	—	†	—	—
2 -	—	—	—	—
3 -	—	impure.	—	—
4 -	—	—	—	—

"In the above table the sign '†' means that a culture of plague was produced in the gelatine tube inoculated from the mixture of microbes and carbolic acid of the strength indicated in the left hand column. The sign '—' means that the gelatine tube remained sterile.

"From the above experiment it appears that a $\frac{1}{2}$ per cent. solution of carbolic acid even after 20 minutes action is incapable of destroying the plague microbe. Disinfection is not certainly produced by 1 per cent. in the same time. Other experiments gave similar results. Kitasato found that 1 per cent. of carbolic acid was necessary to destroy the plague microbe; $\frac{3}{4}$ per cent. was incapable of destroying it in an hour's time. According to Abel it is not destroyed even in six hours by a 1 per cent. solution. Consequently the plague microbe cannot be regarded as particularly sensitive to the action of carbolic acid.

"Carbolic acid is not much used in practice on a large scale. Its place is usually taken by a substance known in India commercially as 'phenyle.' This is a distillation product containing various phenols and cresols. Its action on the bubonic microbe was tested, with the following results:—

Percentage of Disinfectant.	After 5 to 10 Minutes inoculated into 20 per cent. Gelatine	After 5 to 10 Minutes inoculated into 1 per cent. Gelatine.
0 control.	†	†
·1	—	—
·25	—	—
·5	—	—
·75	—	—
1·0	—	—

"Consequently, phenyle appears to be more active than carbolic acid on the microbe of plague.

"Izal gave the following results:—

Percentage of Disinfectant.	After 5 Minutes.	After 10 Minutes.	After 20 Minutes.	About 1 hour
0 control.	†	†	†	†
·1			impure.	—
·2	—	—	—	impure.
·4	impure.	—	—	—
·6	—	—	—	—
·8	—	impure.	—	
1·0	—	—	impure.	
2·0	—	—	—	
3·0	—	—	—	

"Thus izal in a strength of ·1 per cent. or one in a thousand, appears to kill the plague microbe in an hour. In a strength of one in five hundred it appears to kill it in 5 minutes. Similar results were obtained in another experiment.

"The objection may be raised to both of the last named disinfectants that they are insoluble in water, merely forming in it a milky emulsion. Although this emulsion appears to be quite capable of destroying the microbe under the conditions of the above experiments, it would be rash to conclude that it would be capable of killing it to the same extent, under the conditions that exist in nature. For instance, if the microbe is contained in partially dried human excreta, or if it has soaked into a cow-dung floor, a soluble disinfectant might penetrate the surrounding organic matter and destroy it. On the other hand, it is difficult to imagine how the same penetrative power could be possessed by the globules of an emulsion. Further experiments are necessary before a definite opinion can be expressed on this point.

"Such an objection cannot be raised against lysol, another disinfectant of the same class. This consists of cresols, &c., mixed with a quantity of soap. Owing to the presence of the latter substance the active substances it contains are soluble in water in all proportions. An experiment gave the following results:—

Percentage of Disinfectant.	After 5 Minutes inoculated into Gelatine.	After 15 Minutes inoculated into Gelatine.
0 control.	†	†
·25	—	—
·5	—	—
1·0	—	—
2·0	—	—
3·0	—	—

"Similar results were obtained in another experiment.

"It is well known that naphthaline is not a disinfectant; nevertheless, it has been used widely by the general public in Bombay. As there was a possibility that the impure commercial naphthaline had some antiseptic action, I have put the matter to a test, together with a patent preparation known as 'naphtho-sublimate.' The following results were obtained:—

Percentage of Disinfectant.	Pure Naphthaline.	Impure Naphthaline.	Naphtho-Sublimate.
0 control.	†	†	†
·01	†	†	†
·02	†	†	†
·04	†	†	†
·06	†	†	†
·1	†	†	†
·15	†	†	†

"Naphthaline is insoluble in cold water. In the above experiments I made an emulsion of the substance by suspending a measured quantity in boiling water. While still hot I added the requisite quantities to the series of test tubes of sterilised water. Hence, the naphthaline was in each case more finely divided, and more likely to come into contact with the microbes

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than would be the case in practice. Nevertheless, no antiseptic action could be detected.

"4. *Action of Corrosive Sublimate and Copper Sulphate on the Plague Microbe.*—The above metallic salts were tested, with the following results:—

Percentage of Disinfectant.	Copper Sulphate.	Corrosive Sublimate.
0 control.	†	†
·02	†	—
·04	†	—
·06	impure.	—
·08	†	—
·1	—	—
·15	—	—

"Abel, whose method of work seems to have been somewhat different from mine, finds that ·02 per cent. of sublimate disinfects agaragar cultures within an hour, and that ·1 per cent. disinfects within 10 minutes.

"Copper sulphate, under the name of 'Nela tutiya' can be obtained in almost any village, and, as shown by the above experiment, might be used as a disinfectant in cases of necessity. A 5 per cent. solution of copper sulphate was used by the French Government in 1892 in combating cholera. The objection may, however, be raised against both the above disinfectants that they are precipitated by albuminous and other organic substances, and that they hence lack the penetrative power required in a disinfectant for solid dejecta, &c.

"The fact that solutions of sublimate are somewhat apt to decompose on keeping is not of serious import with regard to the use of this substance on a large scale, as under these conditions the solution is usually freshly made up. A practical difficulty, however, exists in the fact that sublimate is not always readily soluble. Both in Bombay and elsewhere it has been noticed that the 'sublimate' used in disinfecting houses does not completely dissolve in the water employed. I have recently had an opportunity of investigating the matter, and I find that a part of the so-called sublimate refuses to dissolve even in boiling water. Apparently, a part of this sublimate is made of 'ruskapoor.' This is a bazar product consisting of a mixture of sublimate and calomel. The solution obtained in practice possesses some disinfecting power, as I have found by experiment, but it is probably not so efficient as would be a similar solution made of pure sublimate.

"5. *Action of Alkalies on the Microbe of Bubonic Plague.*—As shown by the following experiments, this microbe is remarkably resistant to the action of alkalies.

"The percentages of ammonia expressed in the following table represent the amount of a saturated watery solution of ammonia that was added to the sterilised water employed. In the case of the caustic potash, every precaution was taken that the specimen employed should be fresh and active:—

Percentage of Disinfectant.	Ammonia in 20 per cent. Gelatine.	Ammonia in 2 per cent. Gelatine.	Caustic Potash in 20 per cent. Gelatine.	Caustic Potash in 2 per cent. Gelatine.
0 control	†	†	†	†
·25	†	†	†	†
·5	†	†	†	†
1·0	†	impure	†	†
2·0	†	impure	—	—
3·0	†	†	—	—

In the following experiment with quicklime, the greatest precautions were taken to obtain this substance in its most active condition. Perfectly fresh katni lime was obtained and mixed with water that had been recently boiled to avoid the risk of any of the lime being neutralised by carbonic acid that might otherwise have been present. The following results were obtained:—

Percentage of Disinfectant.	Inoculated into 20 per cent. Gelatine.	Inoculated into 2 per cent. Gelatine.
0 control	†	†
·25	—	†
·5	—	—
·75	—	—
1·0	—	—
2·0	—	—
3·0	†	†

"I took great pains to prove that the cultures obtained from the 3 per cent. lime solution, or rather suspension, were pure, and I have no doubt of the fact. A source of error in experiments with alkalies may here be mentioned. Although the microbe of plague is not readily killed by antiseptics, its growth in liquid cultures is readily inhibited by a too strong alkaline reaction. In the above experiment it is possible that the amount of lime solution added to the gelatine might alter the reaction and so make the food medium less well fitted for the development of the microbe. The two per cent. gelatine used in the above experiment was slightly acid (amphotere) in reaction, and therefore less likely to be altered in this way.

"In practice, however, lime is not likely to be used under such favourable conditions for the development of its disinfectant action. Especially in the hot and damp climate of many parts of India it readily absorbs water and carbonic acid from the atmosphere and thus becomes changed into carbonate of lime which is without action on bacteria. The following experiment more closely imitates the practical conditions of its employment.

"A basket full of the fresh lime, as used in the above experiment, was allowed to stand in the verandah of my laboratory for several days. By this time the lime had changed into a loose powder. This was well stirred up so that the specimen taken should represent the average. The following results were obtained:—

Percentage of Lime.	After 10 minutes in 20 per cent. Gelatine.	After 10 minutes in 2 per cent. Gelatine.	After half hour in 2 per cent. Gelatine.
·0 control	†	†	†
·25	†	†	†
·5	†	†	†
·75	†	†	†
1·0	—	—	impure.
2·0	†	†	†

"Water dissolves 0·13 per cent. of lime, so that the solutions of lime used in both the above experiments were more than saturated. In view of the above results it may be asked whether whitewashing of suspected houses is a valid precaution against the plague. With regard to the outside of the house, it is not likely that it is the source of infection, and so long as whitewashing is in native hands, this part of the work is likely to be considered as the most important because it is most easily visible to an inspecting officer. For instance, a few months ago a native official in a Native State that was threatened with the plague, published an order that only the outside of the houses were to be whitewashed in order to avoid annoying the inhabitants. Rogers Pacha tells me that in combating cholera in Egypt the native employés were very apt to whitewash only the exterior of a house, hoping that the sanitary officer would infer that the inside had also been done. *A priori* it might be urged that whitewashing the inside of the house would be useful because it would involve a turning out of the inhabitants and a ventilation of their belongings while the work is proceeding. I have no wish to deny that this is likely to be the case, but it is probable that the end could be reached in a more effective way.

"Whitewashing has another disadvantage in that lime combines with and neutralises many of the more commonly used disinfectants. For instance, being an

alkali it combines with acids which, as will be shown below, are efficient disinfectants for the bubonic microbe. With carbolic acid and phenyle it forms carbolates which, according to Notter, are of but slight disinfectant power. With sublimate it forms an insoluble compound, probably destitute of antiseptic action. If sulphur is burnt in a freshly whitewashed house, the sulphurous acid produced is likely to combine with the lime, producing calcium sulphite, a substance of doubtful antiseptic power.

"6. *Action of Acids on the Microbe of Bubonic Plague.*—The microbe of plague is extremely sensitive to the action of acids.

"I have tested the action of certain organic acids on this microbe, and the results appear to have some bearing on the epidemiology of the disease. It may be mentioned that 'aromatic vinegar' was much used in the Middle Ages in Europe for destroying the contagion of plague. As will be seen from the following experiments, its essential constituent, acetic acid, has a strong action on the plague microbe.

"Formic acid was tested with the following results:—

Percentage of Disinfectant.	Growth in Gelatine 20 per cent.
·0 control	†
·1	†
·5	†
1·0	—
2·0	impure.
3·0	—

"The following results were obtained with acetic acid in a series of experiments:—

Percentage of Acid.	With 10 per cent. Gelatine.	With 20 per cent. Gelatine.	With 2 per cent. Gelatine.	With 20 per cent. Gelatine.
·0 control	†	†	†	†
·1	†	†	†	†
·2			†	†
·3			—	†
·4			—	†
·5	impure	†	—	†
·7			—	—
1·0	—	—	—	—
2·0	—	—		
3·0	—	—		

"The following experiments were carried out with lactic acid:—

Percentage of Acid.	With 10 per Cent. Gelatine.	With 2 per Cent. Gelatine.	With 20 per Cent. Gelatine.
0 control	†	†	†
·01		†	†
·03		†	†
·05		†	†
·07		—	†
·1	—	—	†
·2		—	†
·3		impure.	—
·5	—		
1·0	—		
2·0	—		
3·0	—		

"To summarise the above results the bubonic microbe is destroyed in five minutes by—

Formic acid of a strength of 1 in 100.
Acetic acid „ „ 1 in 142.
Lactic acid „ „ 1 in 333.

"Most articles of diet either possess an acid reaction or acquire it on decomposition owing to the development of the above acids or of others closely allied to them. In the case of fish and meat a strongly marked acid reaction is present. In view of the above results, it appears scarcely likely that these substances should retain or convey the bubonic plague infection. If grain and other substances containing carbohydrates are kept in a damp place, fermentations set in, which usually, but not always, result in the appearance of fatty acids. Hence it is difficult to understand how the bubonic infection could lurk in rotten grain as has been held by Dr. Waters and others. Shortly after it has been obtained, milk in this country acquires an acid reaction owing to the development of lactic acid. Its action on the bubonic microbe has been investigated by Dr. Srinivasa Rau in my laboratory. The following is an account of his experiments.

"Three test tubes of milk were taken. One contained milk fresh from the dairy. It possessed a faint acid reaction. Another contained milk whose reaction had been made faintly alkaline by the addition of soda. The third contained milk that had been kept from the preceding day, and whose reaction was strongly acid. These three specimens were sterilised in hermetically sealed tubes in the autoclave. On cooling they were inoculated with the bubonic microbe. At the intervals stated below, the infected milk was inoculated on to agaragar with the following results:—

—	Fresh Milk.	Sour Milk.	Alkaline Milk.
At once	Growth	Growth	Growth.
After half an hour.	No plague but one foreign colony.	Sterile	Do.
After 1 hour	Sterile	Do.	Do.
After 1½ hours	Do.	No plague but foreign colonies.	Impure.

"In another similar experiment milk having an amphotere reaction was employed, and the microbe was found to remain alive for 24 hours.

"In the following experiment the conditions were varied in that the infected milk was inoculated into gelatine instead of agaragar:—

—	Fresh (Amphotere) Milk.	Alkaline Milk.	Sour Milk 24 Hours Old.
At once	†	†	†
After half an hour	†	†	†
After 1 hour	†	†	—
After 1½ hours	†	†	—
After 2 hours	†	†	—
After 2½ hours	†	†	—
After 3 hours	†	†	—

"Each of the above gelatine cultures was inoculated into agaragar, and proved to be pure. Other experiments confirmed these results. Thus, as soon as milk has been kept long enough to acquire a well-marked acid reaction, it possesses the power of destroying the bubonic microbe.

"Although the tissues of a living animal, so far as is known, possess an alkaline reaction, those of a dead animal possess an acid reaction which undergoes a great increase on the occurrence of *rigor mortis*. Such acidity is found in the tissues of animals dead of plague. In some experiments carried out in my laboratory by Dr. Rohak to test this point, it was found that before *rigor mortis*, the acidity in the body of a mouse from which the head skin and viscera had been removed, corresponded to 3·76 c.c. of decinormal soda solution per 10 grammes of mouse. The acidity of another mouse estimated after the development of *rigor mortis* required 5·7 c.c. for its neutralisation. The acidity of two mice dead of plague was found to correspond to 5·79 and 4·37 c.c. of soda solution respectively. It is possible that the presence of this acid in the bodies of persons dead of plague may aid in causing the disappearance of the microbe after burial. The point obviously is deserving of further investigation.

"As may be expected, the action of mineral acids on the bubonic microbe is yet stronger than that of organic

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acids. The following table shows the results obtained with nitric and hydrochloric acids:—

Percentage of Acid.	Nitric Acid.			Hydrochloric Acid.	
	A.	B.	C.	A.	B.
0 control	†	†	†	†	†
·01	†	†		†	†
·03				†	
·05	†	†	†	†	†
·07	†		†		
·1	†	—	impure	†	—
·2	†	—		impure	—
·3			—	—	—
·5	—	—	—	—	—
·7		—			
1·0		—	—	—	—

"The following experiments were carried out with sulphuric acid and a mixture of four parts of sulphuric acid and one part of nitric acids:—

Percentage of Acid.	Sulphuric Acid.			Mixed Acids.	
	A.	B.	C.	A.	B.
0 control	†	†	†	†	†
·01	†	†	†	†	†
·02		†	†	†	†
·03	†	impure	†	†	†
·04		—	—	—	—
·05	—	impure	†	†	—
·07	—	impure	—	—	—
·1	—				

The above results may be summarised as follows. The bubonic microbe was found to be destroyed in the above experiments by—

Nitric acid in a strength of 1 in 333.
Hydrochloric acid ,, 1 in 500.
Sulphuric acid ,, 1 in 1,429.

"The great cheapness of sulphuric acid, the probability of its exerting a continued action, and its activity in destroying the bubonic microbe suggest that it might be introduced with advantage as a disinfectant. Provided the soil is not highly calcareous it might be used in a strength of 1 in 250 for disinfecting infected floors. It will be noticed that in the last experiment I tested the action of a mixture of four parts of sulphuric acid with one part of nitric acid on the bubonic microbe, and that its activity appeared to be equal to that of sulphuric acid alone. The waste acids from the Government Cordite Factory are of about this composition, and thus might find employment as disinfectants.

"7. *Action of Reducing Agents on the Bubonic Microbe.*—Among reducing agents, ferrous sulphate has been frequently recommended for the treatment of sewage and filth. It will be interesting to examine its action on the bubonic microbe.

"Ferrous sulphate in solution readily absorbs oxygen from the air. Consequently in the following experiment measured quantities of solid ferrous sulphate were weighed out and added to recently sterilised and still hot water. After the mixture the solutions were again heated. The following results were obtained:—

Percentage of Ferrous Sulphate.	Growth in Gelatine.
0 control	†
·1	†
·2	†
1·0	impure.
2·0	†

"In the following experiment ferrous sulphate was obtained in alkaline solution by the following method. A solution was made containing 10 per cent. of ferrous sulphate, 10 per cent. of tartaric acid, and 1 per cent. of citric acid. The mixture was made faintly alkaline with ammonia. A dark green liquid resulted, but no precipitation occurred. The percentages stated in the following table are those of the iron present on the supposition that it existed as ferrous sulphate. The following are the results:—

Percentage of Disinfectant.	After 10 Minutes.	After 24 Hours.
0 control	†	†
·5	†	†
1·0	†	—
2·0	†	—
3·0	†	—
4·0	†	—
5·0	†	—
6·0	†	—
10·0	†	—

"That is to say, a solution containing 10 per cent. of this strong reducing agent, *i.e.*, the solution originally prepared, had no power of destroying the bubonic microbe during 10 minutes' action. Even a half per cent. solution did not exert an antiseptic action after 24 hours. Control observations were made that showed that the above solutions did possess a strong reducing action after sterilising, that is to say, as used in my experiment.

"The researches of Wilm and other observers show that the bubonic microbe is destroyed by a few hours' drying in a desiccator. It occurred to me that it would be interesting to learn whether it would die out so rapidly if dried in a current of hydrogen gas. To test this I blew a series of bulbs on a glass tube. The portions of the tube between each pair of bulbs were drawn out, so that afterwards each bulb could be easily fused off. Hydrogen from a Kipp's apparatus was passed through a wash-bottle containing silver nitrate, and another containing lead nitrate, to purify it. It then passed through a large wash-bottle containing strong sulphuric acid to remove its moisture. From this it passed through the row of bulbs. The apparatus was kept in action for 24 hours to expel all traces of oxygen. A bouillon culture of plague was then centrifugalised under aseptic precautions. The supernatant liquid was then poured off, leaving a sediment consisting of a dense mass of microbes suspended in a few drops of bouillon. The current of hydrogen was then turned off, and the upper bulbs of the series slightly warmed to expel some of the hydrogen. The distal end of the row of bulbs was then placed in the mass of bacilli in the centrifuge tube. A few drops of the suspension was thereupon drawn up owing to the contraction of the hydrogen on the cooling of the bulbs. By tilting and turning the tube the whole of the inside of the glass was wetted with the suspension of the microbes. The tap from the hydrogen apparatus was then opened and in the current of dried hydrogen the film was rapidly evaporated to dryness. After the hydrogen had passed through the row of bulbs for the whole day, it was hermetically sealed at both ends in a blowpipe flame. One bulb was then fused off, ground up in a sterile mortar with a few drop of bouillon, and the resulting liquid injected into a mouse. This mouse died of plague. Other bulbs were fused off and similarly injected into mice on succeeding days. In this way the microbe was found to be still alive five days after the commencement of the experiment.

"It is impossible to draw a definite conclusion from the above experiment, because owing to the interruption of my work consequent on my transference to Hardwar, I have not been able to carry out analogous experiments in which the microbe should be evaporated to dryness under similar conditions in a current of air or oxygen. At the same time, in view of the asserted influence of ventilation in destroying the infection of plague, the above result is at least suggestive.

"8. *The action of Oxidising Agents on the Bubonic Microbe.*—The above experiments have shown that this microbe is resistant to reducing agents. It will now be shown that it is extremely susceptible to the action of certain oxidising agents.

"The following experiments were carried out with chloride of lime. The specimen employed was per-

fectly fresh and strongly smelling of chlorine. The results obtained are as follows :—

Percentage of Disinfectant.	After 5 Minutes in 20 per Cent. Gelatine.	After 5 Minutes in 1 per Cent. Gelatine.
0 control - -	†	†
·01 - -	—	—
·05 - - -	—	—
·3 - - -	—	—
·5 - - -	—	—
·7 - - -	—	—
1·0 - - -	—	—

"With regard to chloride of lime it may be noted that it loses its disinfectant power when kept in improperly closed vessels. When fresh it has the characteristic and disagreeable smell of chlorine. Owing to this simple fact not being generally known, a merchant of Bombay, at the commencement of the epidemic, was able to sell many barrels of chalk as chloride of lime. The liberation of hypochlorous acid and chlorine from the chloride of lime depends on the absorption of carbonic acid from the air or on the addition of acids. It must be borne in mind that this substance must not be mixed with lime or other alkalies.

"Potassium permanganate is not generally recognised as a useful disinfectant. Although some microbes are so resistant to its action that they are only destroyed by it in a 5 per cent. solution (Koch), my experiments show that it is an extremely potent destroyer of the bubonic microbe. This observation is so contrary to what might have been expected that I thought it advisable to subject it to an extended test. The following table shows my first results :—

Percentage of Permanganate.	A.	B.	C.	D.	E.	F.	G.	H.	I.	J.
0 control -	†	†	†	†	†	†	†	†	†	†
·005 - - -		impure.	—	†						
·01 - - -	—	—	—	†	—	—	—	impure.	—	—
·02 - - -	—	—	—	—	—	—	—	—	—	—
·03 - - -	—	—	—	—	—	—	—	—	—	—
·04 - - -	—	—	—	—	—	—	—	—	—	—
·05 - - -	—	—	—	—	—	—	—	—	—	—
·06 - - -	—	—	—	—	—	—	—	—	—	—
·07 - - -	—	—	—	—	—	—	—	—	—	—
·08 - - -	—	—	—	—	—	—	—	—	—	—
·1 - - -	—	—	—	†	—	—	—	—	—	—

"Experiment 'D' is not comparable with the others, in that the solutions of permanganate employed were those that had been employed two days before the experiment 'C.' The tubes containing ·005 and ·01 per cent. were at the time of reinoculation completely reduced. Before reinoculation of the tube containing ·1 per cent., sufficient gelatine was added to it to completely reduce the permanganate present. Consequently in these three tubes the microbe was not exposed to the action of the permanganate, but only to its decomposition products. As shown by the above results, it was thus proved that the microbe of plague is not harmed by these decomposition products in the strength used in my experiments. That the microbe was really dead in the above series of tubes was also proved by injecting a few drops of each solution into mice. This was done with the tubes that had not been reduced and with the last tube in the series, in which, as already stated, the permanganate had been reduced. All the mice remained in good health except the one inoculated from this last tube, which died of plague.

"Thus the above experiments show that under the conditions of the experiments the bubonic microbe is destroyed within five minutes by permanganate in a strength of 1 in 10,000. Experiment 'C' suggests that even diluter solutions would be efficient.

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"The chief objection to the use of permanganate is that it is so readily destroyed by all sorts of organic matter. Hence, if used to disinfect microbes as they are found in nature, there is a risk of its being reduced so rapidly by the filth mixed with the microbes that the latter would remain unaffected. I noticed that in certain of the tubes containing the diluter solutions of permanganate in the above experiments, on the following day the permanganate was completely reduced. In other words, that the permanganate had first destroyed the bubonic microbes, and afterwards had been reduced by the organic matter inevitably present. It appeared to me to be worth while to put this matter to a further test.

"Permanganate solutions of different strengths were poured into a series of well-grown agaragar cultures. The thick film of culture was then at once stirred up with a sterilised needle and mixed with the permanganate solution. Sufficient of the solution was in each case added to the culture tube to cover the agaragar when the tube was held in an erect position. At intervals, stated below, the suspension of the microbes mixed with permanganate was inoculated into gelatine. Although the amount of organic matter present was far more than enough to reduce the small quantity of permanganate employed, the following results were obtained :—

Percentage of Permanganate.	1 Minute.	3 Minutes.	4 Minutes.	5 Minutes.
·05 - -		—	—	
·1 - -	—			—
·2 - -	—			—
·3 - -	—			—
·4 - -	—			—
·5 - -	—			—
·7 - -	—			—
·8 - -	—			—
·9 - -	—			—
1·0 - -	—			—

"In inoculating the gelatine tubes, two or three drops of the emulsion of the microbes and permanganate solution were removed with a capillary pipette and placed in the gelatine. Hence, there is a probability that masses of the culture film were carried over into the gelatine tubes. Thus the above experiment indicates that the permanganate possesses more power of penetrating than might have been expected.

"In another experiment a ½ per cent. solution of permanganate was poured on to a well-grown agar culture. The film of culture was not disturbed, so that it would have to be penetrated by the permanganate solution for the disinfecting action to be exerted. At intervals, stated below, the culture was tilted so as to bring part of the growth out of contact with the permanganate solution and a visible quantity of the growth was removed by means of a glass bristle and inoculated into bouillon. Tht results were as follows :—

After 1 minute - - - -	Growth.
,, 2 minutes - - -	Sterile.
,, 3 ,, - - - - -	do.
,, 5 ,, - - - -	do.

"The addition of sulphuric acid in the proportion of 294 parts of acid to 316 parts of permanganate increases the amount of oxygen that it liberates. It occurred to me that it would be of interest to see if in this way its action on the bubonic microbe could be increased. In order to find a difference in the action of permanganate under these two conditions, it was obviously necessary to work with diluter solutions than those previously employed. Experiment showed that heating in the autoclave often resulted in the complete reduction of the permanganate, partly owing to the presence of organic matter in the tap water, and partly owing to the presence of dirt on the inside of the tubes. In the following experiment, after making up the solutions, they were merely heated to boiling point in a water-bath. In each case, the solution containing ·001 per cent. of the permanganate was found to be reduced.

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These tubes were therefore used as control. The following are the results:—

Percentage of Permanganate.	Acidified Permanganate.	Neutral Permanganate.	Alkaline Permanganate.
·001 control	†	†	†
·002	—*	—*	—*
·003	—*	—*	—*
·004	—*	—	—*
·005	—*	—	—
·006	—*	—	—
·007	—*	—	—
·008	—*	—	—
·01	—	—	—
·05	—	—	—

"The tubes marked with an asterisk were found to be completely reduced on the following day. The alkaline series of permanganate solutions was made by the addition of one cubic centimetre of normal soda solutions to 50 c.c. of a ·01 solution of permanganate that was used in making up the diluter solutions employed in the experiment. The experiment was repeated with the additional precaution that the test tubes were first boiled in acidulated permanganate solution, then washed in a solution of sulphurous acid, and then again boiled in neutral permanganate solution. In this way organic matter capable of acting on the permanganate was removed from the inside of the tubes. The solutions employed were made up not in tap water but in distilled water, containing three-quarters per cent. of common salt. The following are the results:—

Percentage of Permanganate.	Neutral Permanganate.	Acid Permanganate.
0 control	†	†
·001	†	†
·002	—	—
·003	—	—
·004	—	—
·005	—	—
·006	—	—
·007	—	—
·008	—	—
·009	—	—
·01	—	—

"Thus the above experiments did not show that acid, when added to the permanganate, increased its action on the bubonic microbe. On the other hand, it appeared that whether in acid neutral or alkaline solution if there was enough permanganate present to produce a clearly marked pink colour the microbe was destroyed within five minutes.

"The evidence in my possession leaves, practically, no room for doubt that potassium permanganate when used in well water every three days can check a water-borne cholera outbreak. But there is reason for believing that the cholera microbe is far more resistant to the action of permanganate than is the microbe of bubonic plague. Hence, it might be concluded that permanganate might be employed in checking the latter disease. But, owing to the ease with which permanganate is destroyed by organic matter, and owing to the fact that articles most in need of disinfection are apt to contain large quantities of such matter, it is probable that such strong solutions of permanganate would be necessary, that the expense and inconvenience of the method would call for consideration. That this would be the case is indicated by the following facts.

"The part of a room probably most liable to infection and most in need of disinfection is the floor. Among the poorer classes in this country, floors are generally covered with a mixture of cow-dung and mud. Cow-dung contains substances that rapidly destroy permanganate, as is shown by the following experiment.

"Ten grammes of cow-dung were boiled in a litre of water. A hundred cubic centimetres of the mixture was poured into each of a series of foot-glasses. Progressively increasing quantities of permanganate solution, of a strength of one per cent., were mixed with the contents of the series of foot-glasses. It was found that the addition of 4 c.c. of the permanganate solution was necessary to produce a red colour lasting for a quarter of an hour. In the foot-glasses containing smaller quantities the colour rapidly vanished, owing to the reduction of the permanganate. Now the quantity of permanganate contained in 4 c.c. of the solution was ·04 grammes. The quantity of cow-dung contained in the liquid to which it was added was 1 gramme. Consequently, ·04 grammes of permanganate are necessary to act on 1 gramme of cow-dung. Therefore, in disinfecting a cow-dung floor, each gramme of cow-dung must absorb a quantity of liquid containing ·04 grammes of permanganate. Let us make an assumption probably in excess of the truth, to the effect that each gramme of cow-dung absorbs one cubic centimetre of liquid. Then for disinfection to ensue, each cubic centimetre of the liquid must contain ·04 grammes of permanganate. If one cubic centimetre contains this quantity, then 100 cubic centimetres will contain four grammes, or, in other words, a 4 per cent. solution would have to be employed.

"8. *General Considerations.* — The conditions of the above experiments appear to be more favourable to the disinfectant than would, as a rule, be the case in practice. If a disinfectant is unable to destroy the microbe in 10 minutes, in the absence of foreign substances that might tend to neutralise or mask its action, it is not likely to be always able to destroy the microbe within a reasonable time under the conditions that obtain in practice. This reason, while justifying the condemnation of a disinfectant from the results of such experiments necessitates caution in using such experiments to recommend a disinfectant. In practice, a disinfectant is not required to sterilise test tubes containing suspensions of microbes, but to treat infected floors, clothing, drains, &c. The floor may be made of cow-dung, which generally, though not always, has an alkaline reaction, and this alkali may tend to neutralise acid disinfectants or to hinder the liberation of chlorine from chloride of lime. Clothing and drains are likely to contain mucous, albuminous, and other substances which may precipitate sublimate and other metallic disinfectants. I am at present carrying out a series of experiments on the disinfection of cow-dung floors which I hope will form the subject of a separate report. An adequate disinfection of a cow-dung floor appears from my researches, to be a far more difficult matter than is commonly supposed."

The second letter, dated Agra, 17th July 1897, is as follows:—

"Sir,—I have the honour to submit a further report on disinfection against the bubonic microbe, comprising an account of some experiments that I have recently carried out in infected villages.

"2. In my earlier report on the action of disinfectants on the bubonic microbe, I stated that the conditions of my experiments appeared to be more favourable to the disinfectant than would, as a rule, be the case in practice. Hence it appeared to me to be advisable to carry out some experiments in which practical conditions would be more closely imitated.

"Owing to the fact that the excreta of men and rats suffering from plague are likely to fall on to the floor of houses, and that such excreta are likely in some, but not in all, cases to contain the plague microbe, and owing further, to the probability that the infection of plague gains entrance to the human body, in the majority of cases, through the skin of the feet and legs, it is probably the floors of houses and latrines that are most in need of disinfection. The floors of houses of the lower classes in India are usually covered with a mixture of mud and cow-dung. My experiments, therefore, have been, in the first place, directed to examining the means of disinfecting such floors. The most satisfactory way of carrying out such a test would be to impregnate a cow-dung floor with the microbe of plague, and then to test for its presence after the application of the disinfectant. Unfortunately, however, this is at present impossible, as no reliable test exists for the presence of the plague microbe when mixed with others. Hence I have had to experiment with floors that had not been infected. By estimating the numbers of ordinary microbes present before and after the application of the disinfectant, some idea can be formed of the activity of the latter on a cowdung floor. No doubt some of the microbes present are more resistant than the plague microbe to the action of disinfectants, others, on the other hand, are likely to be a sensitive, and hence it would probably not be safe to

employ a disinfectant against plague that had no action in decreasing the numbers of harmless microbes present on an ordinary floor.

"The method I have employed was to remove as much of the material of the floor as could be taken up on the end of a flattened needle. This was put into a test-tube containing melted agaragar, mixed up well with the food medium, and the mixture was then allowed to solidify. On the following day the number of colonies that had developed was counted. It is needless to say that this method does not give results of any absolute value. If, for instance, the material of the floor was dry, it is likely that most of the microbes present in the specimen removed for examination would adhere to the particles of sand and dirt, and hence each particle would produce only a single colony. If, on the other hand, the particles were damp, it is likely that the microbes adhering to them would more readily become suspended and distributed in the agaragar, and thus produce a large number of colonies. Though the method has no absolute value, it has some relative value if repeated sufficiently often. If a specimen taken before disinfection produced a great number of colonies, and a specimen taken after disinfection produced no colonies after 24 hours, we may infer that some disinfectant action has been exerted. It would not be safe to conclude that the specimen taken after disinfection was absolutely sterile, for microbes might be, and as a matter of fact were, generally present that could not produce colonies after 24 hours, but that did so after a longer interval.

"The following results were obtained in some preliminary observations:—

	Number of Colonies developed after 24 hours.
Earthen floor of my laboratory in Hardwar (a grass hut), before 'lepoing'	800
Do. do.	584
Floor of Dhobi's house (mixed mud and cow-dung)	19,000
Do. ¼ inch from the surface	1,400
Do. sleeping rooms	28,000
Mud floor of Grasscut's room	13,400
Do. ½ inch from surface	640
Floor of bearer's room, recently 'lepoed'	10,500
Do. ½ inch from the surface	6,700
Fresh cow-dung	7,500
Do.	11,500
Earth out of doors exposed to sun	7,000
Do. do.	4,000

"Experiments to test the action of different disinfectants were carried out on the mud floor of the grass hut that served me for a laboratory in the village in which I was working in the following manner. The floor had been covered with the ordinary mixture of mud and cow-dung some days before. Areas about a foot square were divided off from each other by ridges of earth. Two specimens of the mud mixture of each area were examined bacteriologically, as described above, before pouring on the disinfectant. The disinfectant to be tested was then poured on to the surface, so that the whole of it was wetted, but no attempt was made to rub it in. After this at different intervals other specimens were taken and tested. In every case two specimens were taken from different parts of the area. The figures in the following table give the average of the two results. For the sake of clearness, I have not given the actual number of colony-producing microbes found, but I have given the relative numbers that developed for every hundred colonies found in the control observations. For instance, for every hundred colonies present before treatment with sublimate, half an hour afterwards only 60 were present, and 24 hours later the relative number had risen to 130, as shown by the first line in the table:—

Disinfectant.	Before Treatment.	After ½ Hour.	After 1 Hour.	After 2 Hours.	After 24 Hours.
A. Sublimate 1 in 1,000	100	60	55	40	130
B. Sublimate 1 in 1,000, plus hydrochloric acid 2 in 1,000.	100	—	43	—	1
C. Chloride of lime 1 per cent.	100	—		63	315
D. Potassium permanganate 1 per cent.	100	98	55	76	86
E. Sulphuric acid 1 per cent.	100	—	79	57	35
F. Permanganate and sulphuric acid each 1 per cent.	100	17	12	11	7
G. The same mixture diluted ten times.	100	31	49	131	112
H. Sulphuric acid 1 in 250	100	87	63	45	112
I. Sulphuric acid 1 in 500	100	97	140	142	300
J. Sulphuric acid 1 in 500, plus permanganate 1 in 1,000.	100	68	72	63	161
K. Phenyle 1 per cent.	100	—	248	166	138
L. Lysol 1 per cent.	100	—	72	67	220

"After the addition of the disinfectants the treated areas were protected from dust by means of covers placed over them.

"It will be noted that the only substance tried that produced anything approaching a complete disinfection was corrosive sublimate in an acidulated solution. Chloride of lime, phenyle, and lysol appear to be without much action on the microbes of a cow-dung floor, although, as is known, they are energetic disinfectants of microbes suspended in test tubes of bouillon. A comparison of experiments D, E, and F shows that a mixture of permanganate and sulphuric acid acts more strongly than either of these substances alone. The same deductions can be drawn from experiments I and J. As already explained, moistening a cow-dung floor is likely to lead to an increase of the number of colonies that will appear in these experiments. The specimens taken before treatment were obtained from the floor while it was dry. Those taken after treatment were taken when it had for some time been moistened with the disinfectant solution. This is the most probable cause of the increase in the number of colonies developed after the addition of the solution of phenyle in experiment K.

"The following observations were made in houses in course of disinfection. The first case investigated was in a large two-storied pucca built house. This house had been evacuated about two weeks before my visit, and the inhabitants had cleaned it up and had most of the rooms whitewashed. On the first floor I found a small room that the coolies had not thought noticeable enough to whitewash. One or two persons appeared to have used it is a latrine. This is referred to below as room A. The relatively small numbers of microbes or rather colonies met with before disinfection is probably due to the room being pucca built and thoroughly dried. This room was treated with a neutral solution of sublimate of a strength of 1 in 1,000. Room B was a badly smelling place on the ground floor. It had not been cleaned previously. It was treated with sulphuric acid of a strength of 1 in 250, with about half the quantity of permanganate. The specimens were taken about a quarter of an hour and again 24 hours after disinfection. The following are the results:—

Locality.	Number of Colonies in Specimens taken.		
	Before.	¼ Hour after.	24 Hours after.
1. Dirt from floor of Room A	2,080	5	11
2. Ditto	960	6	19
3. Ditto	1,280	256	1,440
4. Ditto	640	—	30
5. Dirt from floor of Room B	1,100	44	117
6. Ditto	2,000	24	35
7. Ditto	—	171	29
8. Ditto	—	25	440
9. Dirt from wall of Room B	400	1	34
10. Ditto	—	88	1,280
11. Cow-dung floor of cook-room	1,200	—	544
12. Ditto	—	—	640
13. Ditto	—	—	12,000
14. Ditto	—	—	768

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"The cook-room had been previously whitewashed. On the day of my visit it was treated with neutral sublimate solution.

"Other observations were carried out in another village. No local cases of plague had occurred there, but some rats had been dying of plague in the house of one of the leading inhabitants. This was a large pucca built ill-ventilated and dirty house. A large quantity of grain was stored in one of the rooms on the ground floor. The owner told me that the doors of the rooms had to be kept shut owing to the depredations of monkeys. The upper stories of the house seemed in great part to be given up to the use of these animals. Acidulated sublimate solution was used to disinfect this house, and I noticed that the disagreeable smell of dirt was still present in each room after disinfection had been carried out. The following results were obtained:—

Locality.	Numbers of Colonies developed in Tubes inoculated with Specimens taken.	
	Before Disinfection.	After ½ Hour.
1. Brick courtyard	9,600	208
2. Ditto	28,000	1,100
3. Outer room, south side, kutcha floor	1,800	1,100
4. Ditto	2,500	78
5. Kutcha stable floor outside granary	25,000	120
6. Ditto	35,000	43
7. Pucca living room	1,900	128
8. Ditto	3,560	192
9. Cook-room	—	352

"In drawing conclusions from the above results it must be borne in mind that the action of acidulated sublimated solution, judging from an earlier experiment, is only likely to reach its maximum after two hours at least, and that the specimens in the above experiment were taken only 15 minutes after the application of the disinfectant.

"Recent work has shown that sulphur fumigation cannot be relied on to destroy microbes. Experiments carried out by the German Health Office have shown that though gaseous disinfectants may destroy the microbe in experiments on a small scale, they will not do so in large rooms, as the gases do not show sufficient penetrative power. I carried out the two following experiments to further test the matter.

"In the first experiment a small godown in the bungalow in which I was staying was treated. The room was closed up as well as was practicable. The men employed in the village to fumigate with sulphur were called in and told to treat the room with sulphur as was customary. They first brought in a portable stove containing a bright coal fire. On this they put a 'degchie' of water to produce steam. Another similar fire was then brought in. On this they threw a handful of flowers of sulphur, which, owing to the strength of the fire, was almost immediately consumed. Then one of them rushed into the room and threw a small quantity of methylated spirit on to the fire containing the sulphur. Owing to the presence of two brisk fires in the room the greater part of the oxygen present was likely to combine with the coal rather than with the sulphur. I was told that, as a rule, in fumigation with sulphur such bright coal fires were not employed, but only enough fire to cause the sulphur to burn. Under the conditions described it was natural that no disinfection should take place. Specimens of dirt taken before fumigation produced from 1,800 to 3,200 colonies. Specimens taken from the same positions after fumigation produced from 2,400 to 5,000 colonies. Some agaragar plague cultures were placed in different parts of the room, and after the fumigation were inoculated on to fresh agaragar. In all cases a typical growth was produced.

"The second experiment was carried out in another small room in the same bungalow. Before fumigation water was thrown over the walls and ceiling of the room, so that plenty of aqueous vapour should be present in the air. The sulphur was burnt in the following manner. About two seers of flowers of sulphur were placed in each of two earthenware pans. Enough methylated spirit was added to it to make the powdered sulphur stick together, so that it could be moulded into a thick column. The columns were then lighted and the door closed. The sulphur burnt for a long time, and a yellowish fog gradually developed in the air in the room. The following results were obtained:—

	Before Fumigation.	After Fumigation.
Dirt from floor	370,000	1,700
Ditto	14,400	6,000
Ditto	—	4,800
Ditto	—	400

"The above results show that a very slight impression on the microbes present had ensued. As in the previous experiment, agaragar plague cultures were placed in different parts of the room before fumigation. After fumigation each culture was inoculated on to fresh agar and in each case it grew. In two of the tubes, however, the colonies were not very numerous, suggesting the possibility that some slight effect had been produced on the microbes present. It may be objected to this part of the experiment that the bubonic microbes were present in test tubes closed in each case by a plug of cotton wool, and that thus they were to some extent protected from the action of the gas. But in practice the sulphurous acid gas would have to penetrate far more serious obstacles than loose cotton wool if it is to be of any use at all. Another condition that might not always exist in practice was in favour of the sulphur, namely, that the bubonic microbes exposed to its action were moist. Sulphur, when burnt, produces sulphur dioxide. This is only disinfectant when it has combined with water forming sulphurous acid. Hence microbes in a damp condition are more likely to be affected than if they are dry.

"There remains another way of treating an infected floor which, where practicable, is likely to give better results than can be obtained with a chemical disinfectant, namely, by exposing it to the action of fire. The following experiment was carried out to test this possibility.

"An area of earth, about 10 feet square, under the shade of a tree was covered with a mixture of mud and cow-dung. The smooth surface thus produced was allowed to dry during four days. Then a small portion of the surface was again covered with fresh cow-dung and mud. The whole was then covered with a layer of dry grass about two inches thick. In addition, bamboos about an inch thick were laid side by side at about half an inch distance from each other over about half the area. The grass was then set alight, and after the fire had gone out the surface was tested with the following results:—

	Before Burning.	After Burning.
1. Surface afterwards covered with a thick layer of grass.	1,600	1
2. Ditto ditto	1,080	—
3. Surface covered with a thin layer of grass.	—	400
4. Half an inch below the part of the surface covered with a thick layer of grass.	3,200	22
5. Ditto ditto	2,000	100
6. Two inches below above surface	—	900
7. Freshly made surface afterwards covered with grass and bamboos.	7,300	—
8. Ditto ditto	2,400	—
9. Half an inch below this surface	—	—
10. Ditto ditto	—	2
11. Two inches below above surface	—	84

"Thus, in the above experiment complete disinfection appears to have been produced by the burning of a layer of grass two inches thick. Where the heat was greater, owing to the combustion of the bamboos, the disinfectant action appears to have reached to some distance below the surface. Although probably the

quickest and most certain method of freeing an earthen floor from infection, the method of firing must be, for obvious reasons, limited in its applicability. It was tried with apparent success in an infected chawl in Bombay inhabited by the families of policemen. Grass, as in my experiment, was burnt all over the floors, and so far as I am aware no more cases of plague occurred. Though the method can thus be carried out with the help of intelligent supervision, it would probably lead to accidents if employed in a town on a large scale. In most cases, however, it can be used in public latrines, which are frequently made of corrugated iron or other incombustible material. Both on the general grounds that human excreta are apt to contain the microbe of the disease and on the *à posteriori* evidence of the Hong Kong epidemic, it is probable that public latrines may become sources of infection, and consequently are greatly in need. of efficient disinfection. Owing to the existence of caste and other prejudices the disinfection of public latrines is very often shirked. Further, if ordinary disinfectants are used it is not easy for an inspecting officer to know whether the work has been properly carried out. Hence I suggest that public latrines in infected areas should be frequently treated with burning grass or other fuel. The sweeper could put a bundle of grass into each compartment and light it. Afterwards the ashes could be washed out with a dilute solution of sulphuric acid (1 to 250 of water).

"The probable efficiency of disinfectants is not the only factor to be taken into consideration. Their cost must also be noted. Taking commercial prices for large quantities, the cost of various possible disinfectants is as follows:—

	Number of gallons of the solution obtainable for one rupee.
1. Sublimate 1 in 1,000	15
2. Sublimate 1 in 1,000 plus hydrochloric acid 2 in 1,000	14
3. Sulphuric acid 1 in 250	1,920
4. Sulphuric acid 1 in 250 plus 1 in 500 of permanganate of potassium	128
5. Phenyle 1 in 100	144

"The above prices do not include cost of transit, which is higher for the acids than for the solid disinfectants.

"Another question that must be taken into consideration in choosing a disinfectant is whether its action is likely to be lasting, whether in other words its employment is likely to make the medium unsuited for a considerable time for the life of the bubonic microbe. This is possibly more important in the case of bubonic plague than with other diseases. Not only in this disease is a disinfected area liable to be reinfected by human patients, but in addition in many cases this may occur through the agency of infected rats. Hence a disinfectant that merely destroys the microbes present at the time, and that has no lasting action, is not sufficient for the purpose. As shown by previous experiments, acidulated sublimate solution is the only one of the disinfectants tried that showed a clearly good action on a cow-dung floor. Unfortunately, however, solutions of mercuric chloride, even with the addition of volatile hydrochloric acid, are by no means stable, especially when mixed with the material of a cowdung floor. Dilute sulphuric acid, on the other hand, is not volatile, and, if used in sufficient quantities, is likely for some time at least to make the floor an unsuitable medium for the bubonic microbe. Although, as shown in previous experiments, there are many microbes in a cow-dung floor not readily affected by it, in the strength recommended, the special sensitiveness of the bubonic microbe to acids in general, and to sulphuric acid in particular, makes it likely that the latter substance will be efficient when used on such a floor. The acid will slowly diffuse to the deeper layers and combine with calcium salts and various alkaline substances that may happen to be present. But the upper layers, which are in most need of disinfection, are most likely to be affected, and the acid will be less quickly neutralised if the floor has been treated with acid sublimate solution on the preceding day. In a locality in which the soil is calcareous, sulphuric acid is not likely to be a convenient disinfectant for cow-dung floors.

"A further consideration bearing on the choice of an antiseptic depends on a view that is generally held by those having experience of plague, namely, that the virus is sooner or later destroyed by ventilation. As I have elsewhere shown, the plague microbe is somewhat resistant to the action of drying, and hence it is difficult to believe that the asserted benefit of ventilation is only due to desiccation tending to destroy the microbe. Its action is more likely to be due to the oxidation processes that are produced by the evaporation of water in the presence of air and light. Many authorities have brought forward reasons for believing that the destruction of microbes through the action of light is in reality due to an oxidation process. Microbes are found not to be destroyed by light when exposed to it under conditions in which oxidation processes cannot occur. My experiments have further shown that the bubonic microbe is very susceptible to the action of such oxidising agents as chloride of lime and permanganate of potassium. If the evidence in favour of the use of ventilation is considered to be sufficient to justify the costly and troublesome method of removing the roofs of houses, and if the good effects of ventilation are admitted to be due to oxidation, ought not cheap and convenient oxidising agents such as permanganate of potassium to be used in combating plague? Unfortunately in the case of cowdung and mud floors, it is not likely to be practicable to employ sufficient permanganate to produce the effect desired. It might be possible in better built houses with cement floors. Permanganate might be used in water suspected of being infected, such as water used by dhobies for washing infected clothing. But owing to the risk of insufficient quantities being employed, it would be most objectionable to put it into the hands of unskilled workers for ordinary purposes. I have shown above that a mixture of sulphuric acid and permanganate is more active in destroying microbes than either of these substances used separately. Such a mixture would have the further advantage of removing smells from dwelling rooms, such smells being unaffected by corrosive sublimate. But it must be borne in mind that sulphuric acid enters into the reaction and is decomposed with the permanganate. Hence the addition of permanganate to dilute sulphuric acid may diminish the durability of the effects of the latter. Strong solutions of permanganate mixed with dilute sulphuric acid slowly decompose with liberation of ozone. With concentrated sulphuric acid the reaction is violent and dangerous.

"It must further be borne in mind that coolies employed in disinfecting work may not carry out their duties thoroughly. Hence it would be preferable for the disinfection of a room to be carried out twice wherever practicable. In the case of one of the rooms referred to above. I told the coolies that as soon as they had finished, I should come to see that they had done their work properly. Nevertheless, after they had finished I found some undisturbed cobwebs in a corner of the room, although the coolies had splashed the disinfectant over the rest of the walls and the whole of the floor and ceiling.

"The above considerations lead me to suggest the following rules for treatment of infected buildings:—

1. In the case of corrugated iron latrines, isolated buildings, and other buildings in which the work can be done with safety under intelligent supervision, a layer of dry grass or other inflammable material at least two inches thick should be laid over the whole of the floor and burnt. Afterwards the whole of the interior of the building should be washed out with a solution containing one part in 250 of sulphuric acid.
2. In the case of dwelling rooms in which there are definite grounds for believing that infection may be present and in which the firing method is not applicable, the whole of the interior should be first washed with a solution of corrosive sublimate of 1 in 1,000 strength, to which hydrochloric acid in the proportion of 2 in 1,000 has been added. On the following day the rooms should, if possible, be washed out with the dilute sulphuric acid.
3. In the case of dwelling rooms in which there is no actual evidence of infection, but which are being merely cleaned out as a precautionary measure, the dilute sulphuric acid should alone be used. The inhabitants should be advised not to 'lepo' the floors after this has been done, with the unfortunately necessary exception of the part of the floor near the cooking place.
4. Dilute sulphuric acid should be used in large quantities for washing out passages, courtyards, and surface drains.

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5. In order to diminish the risk of coolies being burnt by having to handle strong sulphuric acid, it should be diluted with an equal bulk of water before being sent out. To make a solution containing one part in 250, three ounces of strong sulphuric acid, or six ounces of the acid mixed with its own bulk of water should be added to every nand of water; an ordinary nand holds nearly four gallons. A rough indication as to whether or not water has been added to sulphuric acid may be obtained by adding pure sugar to some of the acid. If more than 40 per cent. of water is present, the mixture will not char during the next hour. The sugar employed should be slightly moist.

"Though my experiments are not sufficiently advanced for me to be able to give definite advice, I may point out the probability that clothes, hands, &c., are far more easy to free from the bubonic infection than mud floors, and in such cases therefore a wider choice of antiseptics may be permissible."

8553. What was the result you obtained on testing the disinfection of cow-dung floors with perchloride of mercury?—I found that sublimate, in a neutral solution of 1 in 1,000, not only did not destroy the microbes in a cow-dung floor, but led to an apparent increase in their number.

8554. In what time?—Twenty-four hours later there was an apparent increase in their number,—that is to say the sublimate in a neutral solution was absolutely useless. On the other hand, I found that sublimate in an acid solution had a very strong disinfectant action. At the end of 24 hours it appeared to have destroyed 99 per cent. of the microbes present. The reason is obvious and simple. The sublimate is precipitated by the alkaline matters present in the cowdung floor. If you acidulate your solution the sublimate remains in solution, and can therefore kill the microbes.

8555. So long as you add enough of the solution?—Yes.

8556. That would be a very large quantity?—Certainly. In my experiments this disinfecting action was confined to most superficial layers of the floor. A difficulty in disinfecting a cowdung floor does not only exist in the case of sublimate. I found that the cow-dung floor contains substances which neutralise in some way the activity of carbolic acid. That is in some late experiments which are not in the letters I have just put in.

8557. What is the reaction of cow-dung?—Cow-dung is generally alkaline.

8558. What is the general result of these experiments with regard to mud floors?—I regard them as extremely difficult to disinfect. I suggest that where practicable, burning the surface of the floors would be the best way of dealing with the difficulty. There is always a risk in digging up the floor with a pick-axe; people might be infected. It would be well to throw sublimate solution over the floor first, and then dig it up and burn it. That is probably the most satisfactory way, in cases in which it would be dangerous to burn the floor *in situ*.

8559. You would only remove a fraction of an inch of the surface?—No.

8560. Would you state to what depth?—I would suggest about six or eight inches.

8561. Of all the disinfectants you have experimented with, which disinfectants or combination of disinfectants do you find the best?—I believe that sublimate in an acid solution is the most reliable disinfectant for ordinary purposes.

8562. If the floor were not an earth floor, I suppose these disinfectants would be much more effective?—In a well built house disinfectants would have a far better chance of exerting a satisfactory action.

8563. Stone or wood material, I suppose?—Yes, impervious floors.

8564. I think you have made some observations in regard to the extension of plague in towns and in villages, and especially in regard to the interval of time which elapses between the first introduction of plague, and the occurrence of indigenous cases in the towns or villages: will you tell me what was the nature of your observations?—The evidence I have collected as regards this asserted interval that sometimes occurs between the introduction of plague, and its outbreak amongst human beings I have placed in an article* published in the "Annales de l'Institut Pasteur" for November 1898, and which I have laid before the Commission. Without coming to any very definite conclusions I have quoted such cases as I could collect. In support of the assertion, I beg to point out that in the number of the "Annales de l'Institut Pasteur" for for the preceding month, October, there is a paper by M. Simond who, quite independently of me, has arrived at the same conclusion. He has travelled a great deal in India studying plague, especially in Cutch, near Karachi, and that part of India. He has collected various instances which tend to show the frequent existence of a prolonged period between the first importation and the outbreak of the disease.

8565. Can you state what that period usually is?—I have not made any definite statement about it in my paper. The evidence is not such as to warrant any definite conclusions, but it is of the very greatest importance to collect available evidence and summaries of available evidence bearing upon the point. I have quoted the opinions of others to the effect that there is an interval of about a month or six weeks in such cases.

8566. Have you any opinion as to why this long interval occurs?—Not only have I no opinion, but I think its importance is in that it indicates that no hitherto published theory as to the propagation of plague is sufficient to explain the facts. They are absolutely beyond explanation in the present state of our knowledge. The explanation suggested by M. Simond about the influence of rats in such cases, that the interval depended upon the time taken by the microbe to proceed from an infected man to clothing, from thence to the rats, and then from rats to men, appears to me to be entirely insufficient.

8567. Your evidence points to this, that the interval is one of several weeks?—By no means always.

8568. What is the shortest?—I have merely quoted certain cases in which there was this long interval. There is the case of Satara, where the interval was asserted to be a long one. I criticised the evidence given with regard to it.

8569. Have you any instances in which the interval was a briefer one?—I have quoted in that paper cases of a very brief interval after importation of infection of human beings having been attacked.

8570. There appears to be no general rule?—I do not think it would be wise to frame any general rule at present.

8571. The intervals appeared to vary so much in various places?—Yes.

8572. If it were a long interval of more than a week or two, for instance, it would be very important, in so far as administrative measures are concerned?—I presume it would have great bearing in that direction.

8573. (*Dr. Ruffer.*) How far do you think the microbe of plague can penetrate into the earth when thrown on the surface?—Supposing it was thrown on to the earth in some liquid secretion, or in sputum, or in urine, I suggest that it is not likely of itself to penetrate more than an inch or half an inch—perhaps less, provided the surface is continuous.

8574. Do you think the bacillus could penetrate into the ground more than an inch?—I should put that as the outside limit under ordinary conditions; that is to say, with ordinary compact mud floors. Of course, if there are cracks or crevices, it would be a very different matter.

8575. It has been suggested to us that the microbe spreads through the floor: do you believe such a thing is possible?—No.

8576. Is the microbe absolutely non-motile?—I believe it is practically non-motile.

8577. Therefore it must always be carried by some external agency?—Yes.

8578. Do you think that the superficial disinfection of a floor, say for the depth of half an inch, would be sufficient to destroy all the plague microbes in that floor?—I believe that such superficial disinfection would be sufficient to destroy any microbe that happened to be there, but there is a further possibility that the microbe might be brought into the room by means of infected rats, or infected fleas, or bugs, or all sorts of things. A large quantity of sublimate solution

* Not reprinted in the Proceedings of the Commission.

would be required, and a certain amount of scraping of the surface would be needed. In the case of a mud floor it is a question whether a sufficient quantity of sublimate solution could be employed in practice.

8579. I understand that in some cases in which you disinfected the floor with a neutral solution of sublimate you found an apparent increase of microbes in the floor: how do you explain that?—That may be due to an unavoidable fault in my method. I merely picked up samples of earth to be tested on the end of a flattened needle. This method can only give approximate results. In these cases in which disinfectants were absolutely destroyed by substances present in the cow-dung floor, it is probable that, with the water remaining on the floor, the microbes, instead of being jammed together and adherent to little particles of dirt, became suspended in this water.

8580. You mean to say that the disinfection was insufficient; you do not mean to imply more than that?—No; there is a possibility that this moisture may have led to an actual besides an apparent increase in the microbes on the floors.

8581. I believe you have examined earth in various places in India under the microscope?—Yes.

8582. Dr. Lawrie has stated that a simple microscopic examination of the floor will reveal the presence or absence of the plague bacillus; do you think that is possible?—I think it is absolutely impossible.

8583. Is it a fact that microbes showing bi-polar staining and a central clear space are extremely common in nature?—They can be very readily found in the most varied positions by appropriate methods.

8584. Have you any evidence as to the effect of the plague bacillus in rabbits?—I have not made many experiments on rabbits, being under the impression that they are relatively resistent to plague compared with rats.

8585. Dr. Lawrie has given evidence regarding the inoculation of rabbits with earth containing the supposed plague microbe. In some cases the rabbit died within 24 hours, and in most of his experiments, I think, the rabbits died under three days. Now you tell us that the rabbit is rather resistent to the plague microbe?—Is relatively resistent: it needs quite a large dose of pure culture to produce death, and it is highly improbable that it would be killed by a small quantity within 24 hours.

8586. Does the presence of mud mixed with the plague microbe rather inhibit the development of plague in animals?—In other animals I found that a mixture of mud with plague microbes in many cases prevented the development of the disease, and, in other cases, prevented the animals dying from a typical form of the disease.

8587. In your evidence you mentioned Pfeiffer's reaction: did you refer to the injection into animals of the plague microbe mixed with protective serum?—No, but to the sedimentation or agglutination test.

8588. We have had it before us that if earth mixed with the slightest trace of the plague microbe is injected into rats, the rats invariably die of plague; is that your experience? We have been told, for instance, that if a little earth be placed in a test tube containing microbes, the earth washed out, and the washings injected into rats, these animals invariably die of plague: do you believe that is a good method?—I do not believe that is a good method.

8589. I gather from your evidence that you have obtained very different results?—In certain cases, but there is a great variation: that is to say, you can never rely upon the results of the experiment. It might give results if the plague microbes were very virulent, but certainly not with plague microbes if at all attenuated.

8590. I want to ask you a few questions about the table you have put in with your précis of evidence to show the results of bacteriological examination of suspected substances sent to you for examination from Hardwar and the neighbourhood. Your table may be summarised as follows:—

SUBSTANCES of HUMAN ORIGIN examined.

From what Place.	Dates between which examined.	Number examined.	Microbes resembling those of Plague.		Remarks.
			Detected.	Not detected.	
Hardwar	22.9.97—24.2.98	26	10	15	In one case cultures sent resembled those of plague.
Kankhal	14.4.97—29.3.98	22	16	6	
Jawalapur	12.1.98—26.3.98	33	28	4	1—suspicious.
Jamalpur	24.2.98—20.4.98	7	3	4	
Jagjitpur	1.1.98—24.2.98	7	3	3	1—suspicious.
Bahardurpur	26.1.98—30.3.98	5	1	2	2—suspicious, one with involution forms.
Mustafabad	20.3.98—7.4.98	4	1	3	
Dhanpura	16.2.98—12.4.98	5	1	4	
Ranimazra	9.1.98—2.3.98	3	1	2	
Other villages	1.5.97—12.4.98	20	4	16	

SUBSTANCES of ANIMAL ORIGIN examined.

Hardwar	16.10.97—17.11.97	16 monkeys	4	11	1—suspicious.
	1.11.97	1 (?) mouse	1	0	
	8.11.97	1 rat	0	1	
Kankhal	15.6.97—14.10.97	10 rats	5	5	
	4 & 5.10.97	2 monkeys	1	1	
Jawalapur	17.2.97—22.3.98	8 monkeys	4	3	1—suspicious.
Mayapur	- - - -	1 rat	0	1	

What do you mean exactly by "microbes resembling plague"? Do you mean that you had no doubt that they were plague microbes, and what were the tests you applied?—Those were dried films on cover glasses sent to me.

8591. I thought possibly you referred to experiments on animals or cultures?—No. The table refers only to reports of microscopic examination of coverslip specimens. In certain cases the results of microscopic examination were confirmed by culture and experiments on animals.

8592. You have made experiments by injecting suspected substances into mice. Could you put into your evidence a list of these experiments?—Yes. The following is a list of the injections made into mice of substances obtained from a room in Currey Road,

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Bombay, in which a whole family had been attacked with plague within three or four days:—

Number of Mouse.	Substance injected.	Result.
1	Earth from floor	Death after 24 hours.
2	„ „	„ 96 „
3	Another specimen of earth	„ 24 „
4	„ „	„ 24 „
5	Another specimen of earth	Survived.
6	„ „	„
7	Another specimen of earth	Death after 48 hours.
8	„ „	Survived.
9	Another specimen of earth	Death after 48 hours.
10	„ „	„ 8 days.
11	Stain of dried saliva found on a stool	Survived.
12	„ „ „ „	Death after 18 days.
13	Water in brass lota on floor	„ 72 hours.
14	„ „	„ 5 days.
15	Water in large degchie	Survived.
16	„ „	„
17	Dejecta from corner of drain	Death after 24 hours.
18	„ „ „	„ „
19	Millet found between grindstones	„ „
20	„ „ „	Survived.
21	Stain on clothing (? vomit)	Death after 25 days.
22	„ „	Survived.
23	Drain outside house	Death in 48 hours.
24	„ „	„ after 5 days.
25	Dust from bamboo lamp-frame over shrine.	Survived.
26	Dust from bamboo lamp-frame over shrine.	„
27	Stain of saliva mixed with betel on edge of drain.	Death in 24 hours.
28	Stain of saliva mixed with betel on edge of drain.	Survived.
29	Dust from a shelf	„
30	„ „	Death in 24 hours.
31	Canvas sacking used as bedding	„ „
32	„ „ „	Death after 12 days.
33	Salt found in an earthen pot	Survived.
34	„ „ „	„
35	Partly-eaten pudding made of rice on floor by corpse.	„
36	Partly-eaten pudding made of rice on floor by corpse.	„
37	Washings of three cigarettes found on the floor.	„
38	Washings of three cigarettes found on the floor.	„

8593. You did not find the plague microbes in any of these?—Not in any of these cases. In addition to one or two suspicious cases mentioned in the report from which the list is quoted, in another of these mice I found a microbe which in culture resembled that of plague, but which refused to grow in a second culture—second (agar bouillon) cultures inoculated with it remained absolutely sterile, as in certain experiments on vibrios by Metschnikoff.

8594. You give in the report* you made in connexion with the Bombay Plague Research Committee a formula for the detection of microbes, as follows:—"A solution was prepared containing ferrous sulphate 10 per cent., tartaric acid 10 per cent., citric acid 1 per cent. The solution was made faintly alkaline with ammonia. I had previously found that the bubonic plague microbe was not destroyed by immersion for 24 hours in water containing a proportion of the above mixture corresponding to a half per cent. of ferrous sulphate. From one to eight drops of the above mixture were added to a series of bouillon tubes, which were then inoculated with unsterilised tap-water to which the plague microbe had been added. On the following day each bouillon tube was inoculated on to agaragar. The cultures thus obtained from the bouillon tubes, containing from one to six drops of the solution, contained many kinds of microbes, while those obtained from tubes containing from seven to eight drops only contained colonies of one other microbe besides that of plague, according to Dr. Rau. Though it does not seem to me to be probable on general grounds that this method could separate the plague microbe from those with which it may often be associated, the point here raised appears to me to be worth working out." Could you give us the exact method you now use?—This is only an account of a simple experiment, which I stated would be repeated.

8595. Have you no further experiments on that point?—I have a recollection of making a further experiment in which I obtained a negative result. I say: "The point here raised appears to me to be worth "working out."

8596. I understand, then, that this is not a definite method which you put forward?—By no means. I am extremely sceptical as to whether it would be useful.

8597. We have had it in evidence that it was useful?—I suggest that the evidence needs careful scrutinising; the method might be useful in a limited class of cases.

8598. You recollect your experiments with Captains Leumann, James, and Thomson in salted media? Have you any further evidence with regard to the practical use of such media?—Simply what I have stated, and that different members of the German Commission have repeated independently, confirming my results.

8599. Have you found that it did not give the same results in other cases?—No. I find that it appears to be the most useful practical test of all for identifying plague cultures if recently obtained from patients. This was my experience both in Bombay and Jawalapur. But in certain cases it appears that the microbe ceases to react to the salt agar test if it has been kept in a laboratory for a time.

8600. Have you ever found the microbe in flies?—No, and I have examined flies found dead in the laboratory without finding any.

8601. Have you ever examined the urine of plague patients for plague microbes?—No.

8602. The urine of rats?—Yes, I have examined the urine of rats which have died of plague on several occasions, but without finding the microbe. In one case, of a rat found dead in Kankhal, I found the intestines full of blood containing plague microbes.

8603. Have you found it in the bloody dejecta of man?—No, but I imagine it is there because, according to the German Commission, it is always present in a pure culture in the bile of plague cases.

8604. I believe that you have made certain experiments regarding the vitality of the plague microbes in grain?—Yes, the results were reported in a letter to the Bombay Government, dated the 17th of February 1897, as follows:—

"2. My experiments have been carried out with numerous specimens of the following articles:—

Linseed.	Poppyseed.
Yellow rapeseed.	Wheat (new hard red)
Brown „	„ (another lighter variety).
Tilseed or Gingelly seed.	Flour.
Groundnuts.	
Castor seed.	

"3. In order to test whether the microbe was still present in a living condition in a specimen of previously infected grain, my method has been to make an extract of this grain and to inject it into a mouse. The great susceptibility of mice to bubonic plague and to infectious diseases in general, while advantageous in one sense, has been disadvantageous in another, in that the mice might have died owing to the presence of other microbes than the bubonic in the grain. In some cases the *post-mortem* appearances have suggested that this has occurred; but as it is impossible to give an absolute proof that the bubonic microbe had nothing to do with the death of the animal in these cases, I have in general regarded the survival of the mouse as the only adequate proof that the microbe in question was no longer living in the previously infected grain.

"4. My first experiment was carried out with the bubonic plague microbe derived from cultures on agaragar. Two cultures, each about a week old, were employed. Of these, one had been derived from a patient in Bombay, the other had been recently isolated from a rat found dead of the plague. The growth was

* Not reprinted in the Proceedings of the Commission.

scraped off the surface of the jelly and well shaken up in 15 cubic centimetres of bouillon. The mixture was then placed in a burette. A sample of the grain to be tested, weighing about a kilogram, was placed in a previously sterilised stoppered foot-glass. One cubic centimetre of the bouillon emulsion of the microbe was then poured into the foot-glass, care being taken that it should fall into the centre of the grain. The stopper was replaced, and the foot-glass was immediately violently shaken for about a quarter of an hour. At the end of this time all traces of moisture from the bouillon that had been added had completely vanished. On shaking, a cloud of dry dust could be seen in the air in the foot-glass. In order to avoid inhaling this presumably infected dust, the next part of the experiment was carried out in the open air. The grain was poured from the foot-glass into the linen bag in which I had received the specimen. From the bag a bulk of about 40 cubic centimetres was poured into a measuring glass that had been previously sterilised. This small bulk of grain was then wetted with sterile bouillon and stirred up with a glass rod. About a half to a quarter of this bouillon was sucked up into a pipette and injected into a mouse. The white mice employed had generally been in my possession for some time. Each lived in a separate cage. The cage before being occupied had in all cases been sterilised in an autoclave. The pipettes employed for the injections were always disinfected by boiling in water previous to use. The skin of the mouse at the point of inoculation was previously to the injection rubbed with a mixture of carbolic acid, water and alcohol.

" 5. The extracts made in this manner, as soon as possible after the infection of the grain, were injected into mice with the following results:—

Mouse, treated with extract of linseed, died within 24 hours.
Mouse, treated with extract of yellow rapeseed, died within 72 hours.
Mouse, treated with extract of brown rapeseed, died within 24 hours.
Mouse, treated with extract of tilseed, died within 48 hours.
Mouse, treated with extract of groundnuts, died within 24.
Mouse, treated with extract of castor seed, died within 24 hours.
Mouse, treated with extract of poppyseed, died within 24 hours.
Mouse, treated with extract of wheat (new hard red), died within 48 hours.
Mouse, treated with extract of wheat (of another kind) survived.
Mouse, treated with extract of flour, died within 48 hours.

" 6. Two days after the infection of the grain, specimens were again taken extracted in exactly the same manner as before and injected into another series of mice, with the following results:—

Mouse, treated with extract of linseed, died within 7 days.
Mouse, treated with extract of yellow rapeseed, died within 24 hours.
Mouse, treated with extract of brown rapeseed, died within 4 days.
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, died within 11 days.
Mouse, treated with extract of castor seed, died within 48 hours.
Mouse, treated with extract of poppyseed, died within 48 hours.
Mouse, treated with extract of wheat (first variety), survived.
Mouse, treated with extract of wheat (second variety), survived.
Mouse, treated with extract of flour, died within 48 hours.

" 7. At this time I found out that an extract of castor seeds to which no bubonic microbes had been added was equally fatal as the infected seeds to mice, and consequently was obliged to omit this article from my experiments. The reason of this is that the castor seeds contain a poison known as ricin, which is intensely active on subcutaneous injection. Stirring up the seeds with bouillon as described caused a fatal dose to pass into solution. The mouse injected with such an extract would certainly die whether or not the bubonic microbe was present. If I made the extract of the seeds so rapidly that a fatal dose of the poison would not be dissolved, I could have no certainty that sufficient time had elapsed to allow the microbes to pass into suspension in the bouillon.

" 8. Four days after the commencement of the experiment, extracts of the grain were again made as before and injected into mice as follows:—

Mouse, treated with extract of linseed, died after 13 days.
Mouse, treated with extract of yellow rapeseed, survived.
Mouse, treated with extract of brown rapeseed, survived.
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, survived.
Mouse, treated with extract of poppyseed, survived.
Mouse, treated with extract of wheat (first variety), survived.
Mouse, treated with extract of wheat (second variety), survived.
Mouse, treated with extract of flour, survived.

" 9. Eleven days after the commencement of the experiments extracts were again injected. A change in procedure was made in this case in that the grain, instead of being merely stirred in a measuring glass with a glass rod in order to produce the suspension in the bouillon, were slightly ground up in a mortar until the mixture of bouillon and debris was so thick that I could with difficulty suck it up into the pipette. The results obtained were as follows:—

Mouse, treated with extract of linseed, survived.
Mouse, treated with extract of yellow rapeseed, survived.
Mouse, treated with extract of brown rapeseed, died within 24 hours.
Mouse, treated with extract of tilseed, died within 7 days.
Mouse, treated with extract of groundnuts, died within 24 hours.
Mouse, treated with extract of poppyseed, survived.
Mouse, treated with extract of wheat (first variety), survived.
Mouse, treated with extract of wheat (second variety), survived.
Mouse, treated with extract of flour, survived.

" 10. Thirteen days after the commencement of the experiment extracts were again injected into mice with the following results. In this, as in later experiments, the grain was extracted by grinding it in a mortar with the bouillon.

Mouse, treated with extract of linseed, survived.
Mouse, treated with extract of yellow rapeseed, died after 24 hours.
Mouse, treated with extract of brown rapeseed, survived.
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, survived.
Mouse, treated with extract of poppyseed, survived.
Mouse, treated with extract of wheat (first variety), survived.
Mouse, treated with extract of wheat (second variety), survived.
Mouse, treated with extract of flour, survived.

" 11. The mouse treated with the yellow rapeseed extract showed no appearances microscopically or otherwise of having succumbed to bubonic infection. There was nothing noteworthy at the seat of inoculation in the back, but there was an extensive blood-stained œdema on the underside of the neck, but appearances suggesting that it had died from some accidental infection.

" 12. The above experiment indicates that the bubonic microbe derived from pure cultures perishes within thirteen days after being added to the above-mentioned specimens of grain and seeds. The question now arises whether the microbe would show a greater or lesser degree of resistance when derived from the organs of animals dead of the disease. A reply to this question is given in the following experiment.

" 13. The spleen of a rat and the spleen, liver, and œdema from a mouse—both animals having died after plague inoculation—were ground up in a sterile mortar with powdered glass and mixed with 10 cubic centimetres of bouillon. One cubic centimetre of the mixture was added to half a kilogram of each of the specimens of grain immediately and violently shaken

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as in the previous experiment. Extracts were at once injected into mice with the following results:—

Mouse, injected with linseed, died within 48 hours.
Mouse, injected with yellow rapeseed, survived.
Mouse, injected with brown rapeseed, died in five days.
Mouse, injected with tilseed, died in six days.
Mouse, injected with groundnuts, died in six days.
Mouse, injected with poppyseed, survived.
Mouse, injected with wheat (second variety), died in four days.
Mouse, injected with flour, died in four days.

"14. The fact that two mice in this series survived and that the others only succumbed after an unusual delay may be due to the fact that the grains were extracted very rapidly with the bouillon and not ground up in it as in the preceding and following experiments. Consequently it is probable that fewer microbes than usual became suspended in the bouillon extracts.

"15. Two days later, extracts were again made and injected into mice as follows:—

Mouse, treated with extract of linseed, died within 24 hours.
Mouse, treated with extract of yellow rapeseed, died within 24 hours.
Mouse, treated with extract of brown rapeseed, died within 24 hours.
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, died in 24 hours.
Mouse, treated with extract of poppyseed, died in three days.
Mouse, treated with extract of wheat, survived.
Mouse, treated with extract of flour, survived.

"16. Four days after the commencement of the experiment extracts were again made and injected as follows:—

Mouse, treated with extract of linseed, died in five days.
Mouse, treated with extract of yellow rapeseed, died in three days.
Mouse, treated with extract of brown rapeseed, died in two days.
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, survived.
Mouse, treated with extract of poppyseed, survived.
Mouse, treated with extract of wheat, survived.
Mouse, treated with extract of flour, survived.

"17. The above mice that died showed no appearances under the microscope or culturally suspicious of bubonic plague. Their spleens were injected into three other mice, which have remained in good health.

"18. Six days from the commencement of the experiment extracts were again injected into mice with the following results:—

Mouse, treated with extract of linseed, survived.
Mouse, treated with extract of yellow rapeseed, survived.
Mouse, treated with extract of brown rapeseed, survived,
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, survived.
Mouse, treated with extract of poppyseed, survived.
Mouse, treated with extract of wheat, survived.
Mouse, treated with extract of flour, survived.

"19. Thus, in this experiment grain infected with the organs of animals dead of the plague lost its infectious power completely within six days.

"20. The remaining point of the inquiry is the resisting power of the microbes as it exists in secretions of the human patient. For this purpose I chose the sputum in which the microbe has been shown by Surgeon-Captain Childe, Professor of Pathology in the Grant Medical College, to exist in large numbers and in a very virulent condition.

"21. Sputum recently obtained from a patient was mixed with an equal volume of bouillon. One cubic centimetre of the mixture was immediately added as before to each of the specimens of grain. Owing to an accident, the linseed could not be used in this experiment.

"22. Extracts made immediately were injected into mice with the following results:—

Mouse, treated with extract of yellow rapeseed, died within 24 hours.
Mouse, treated with extract of brown rapeseed, died within 24 hours.
Mouse, treated with extract of tilseed, died within 24 hours.
Mouse, treated with extract of groundnuts, died within 24 hours.
Mouse, treated with extract of poppyseed, died within 24 hours.
Mouse, treated with extract of wheat, died within 48 hours.
Mouse, treated with extract of flour, died within 24 hours.

"23. Two days later extracts were again made and injected. The results were as follows:—

Mouse, treated with extract of yellow rapeseed, died within 24 hours.
Mouse, treated with extract of brown rapeseed, died within 24 hours.
Mouse, treated with extract of tilseed, died within 24 hours.
Mouse, treated with extract of groundnuts, died within 28 hours.
Mouse, treated with extract of poppyseed, died within 24 hours.
Mouse, treated with extract of wheat, died within 48 hours.
Mouse, treated with extract of flour, died within 24 hours.

"24. Four days after the commencement of the experiment extracts were again injected as follows:—

Mouse, treated with extract of yellow rapeseed, survived.
Mouse, treated with extract of brown rapeseed, died within 24 hours.
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, survived.
Mouse, treated with extract of poppyseed, survived.
Mouse, treated with extract of wheat, died within 48 hours.
Mouse, treated with extract of flour, died within 48 hours.

"25. Six days after the commencement of the experiment extracts were made and injected with the following results:—

Mouse, treated with extract of yellow rapeseed, survived,
Mouse, treated with extract of brown rapeseed, survived.
Mouse, treated with extract of tilseed, survived.
Mouse, treated with extract of groundnuts, survived.
Mouse, treated with extract of poppyseed, survived.
Mouse, treated with extract of wheat, survived.
Mouse, treated with extract of flour, died in three days.

"26. No reason could be obtained from *post-mortem* appearances or cultures for thinking that the last-mentioned mouse had died of bubonic plague. Further, the flour had shown no special capacity for nourishing the bubonic microbe in my other experiments, so that it would appear to be probable that the bubonic microbe had died out in this case as in the other. Nevertheless, I am continuing my experiments with flour, and hope to make a separate report to you on the subject in a few days.

"27. Earlier experiments carried out with another kind of grain (bajri) has shown me that the bubonic microbe in this case dies out within two days.

"28. In these experiments I had kept the grain damp, so that eventually it became covered with mildew. In the experiments now described, by keeping the grain in a dry condition in bags, I imitated more closely the conditions that exist in commerce. Under such conditions the microbe of bubonic plague appears to die out within from four to six days. In a few instances, my experiments have suggested that it may survive for periods extending up to 13 days. But it must be remembered that my experiments had to be carried out with the aid of mice owing to the impossibility of obtaining a sufficient supply of healthy rats in Bombay at the present time. It is more probable that the death of the mice in these exceptional instances was due to the accidental presence of other microbes than that unusually resistant forms of the bubonic microbe were present."

8605. In these experiments with linseed, rapeseed, &c., artificially contaminated with plague bacilli, you state that a certain number of animals died. Do

you mean to say that they died of plague?—It is impossible to say definitely. Undoubtedly plague, in certain conditions, can kill mice after such a lapse of time as 13 days, without a trace of plague microbes being found in their bodies. As illustrations of this statement, I may quote the following facts. M. Simond has discovered that mice treated with anti-toxin, and then inoculated with plague, will die after a prolonged interval, if the dose of anti-toxin was insufficient, but no plague microbes are to be found, in many cases, in the bodies of such mice. Also the German Plague Commissioners came across certain cases in which the plague microbe was found in plague patients during their life, but after death of the patients could no longer be detected.

8606. I see you say that mice treated with extract of linseed died within 24 hours. Do you mean that these animals died of plague?—Yes.

8607. When you say an animal died of plague in these experiments, do you mean to say that you isolated the plague bacillus?—Yes, that I isolated the plague bacillus in cultures: I generally inoculated 10 or 12 agar tubes from the organs of each mouse in these experiments.

8608. Could you add to your experiments details as to what animals you found the bacillus in, and what animals you did not. For instance, in the experiment above-mentioned, one animal died within 24 hours, and you tell us it died of plague. A little further on you state that another animal died within 11 days. Did that one die of plague too?—Probably. It is impossible to say definitely, but, from general considerations, I suspect that the cause of death was plague.

8609. But could you say in what cases you have found the bacillus, and in what cases you have not?—These are some of the first experiments I did in this direction, and I have not got complete records of the exact observations made on each mouse. I did not appreciate the bearing of the point at that time.

8610. Is there not a fallacy here? Might it not be the case that some animals simply died of the seeds injected at the same time? Might not some have died of the poison present in poppy-seeds, for instance?—I have referred to that possibility in one paragraph. I found it impossible to experiment with castor seeds for that reason.

8611. The question is whether some of these seeds might not take a long time to kill. If you could add to these experiments a note stating in what experiments you found the bacillus, would that not be very useful?—On referring to the experiments, you will see that extracts of poppy and other seeds only produced death in mice when injected a few days after being infected with the microbe. Thus a proof was obtained the death of the mice was not caused by the extracts of the seeds themselves, independently of the plague microbe.

8612. (*The President.*) What is meant by finding the bacillus?—By finding it, I should mean obtaining the plague microbe in pure culture from the organs of the mice, and obtaining from these cultures the characteristic involution forms. I should like to point out that several of the mice inoculated with poppyseed extracts, in the later stages of the experiments, survived.

8613. (*Dr. Ruffer.*) I simply want further evidence so as to make the experiments more conclusive.—The conclusion in question is that animals can die of plague, under certain conditions, without the microbe being discoverable in their bodies after death. I obtained independent proofs of the truth of this conclusion in my experiments on rats in Hardwar, and also, to some extent, in my observations of the bodies of monkeys found dead of plague.

8614. In section 3 of the letter of the 28th of June 1897, which you have put in (*see* Question, No. 8552), you refer to the action of phenols and their allies on the bubonic microbes. What is the exact method you used for these experiments. Did you suspend the bacillus in water, or did you add the phenol to water?—The microbe was suspended in bouillon.

8615. And then you added a considerable quantity?—Yes, a considerable quantity of the microbe was added to the bouillon; where there was a chance of the bouillon interfering with the action of the antiseptic, the microbe was put into sterilised water.

8616. And plates were made?—No. In India, for various reasons, it is advisable to avoid the use of plate cultures as far as possible. What I did was this: I inoculated, after the proper intervals, from the mixture into gelatine tubes, and left it in the tubes. After two or more days, these tubes were examined for signs of growth.

8617. At the temperature of the body?—No, at the temperature of the room.

8618. A temperature exceeding the liquifying point?—The gelatine was liquid, owing to the temperature of the room. The tubes were left lying obliquely, so that the gelatine was in a thin layer. On raising the tube carefully, the growth could be easily seen.

8619. When you have made a culture from the mixture containing the antiseptic and plague microbes, did you neutralize the antiseptic in any way?—Only in the case of the experiments with alkalies, where I used a slightly acid gelatine. In other cases I merely relied on dilution.

8620. In your experiments with phenol or lysol?—No such attempt was made, beyond the dilution.

8621. Did you neutralise the corrosive sublimate and sulphate of copper?—No.

8622. You find, as a matter of fact, that the acids are the best disinfectants?—Apparently, they seem to work in great dilution.

8623. Could you give us an account of the experiments you have made with permanganate of potash. I see you attach great value to that as a disinfectant for plague microbes?—Merely as a disinfectant in these particular test tubes.

8624. Had you tested it practically?—I had not made such suggestion. I have gone on to point out that it would not be a wise or safe thing to use this in actual practice of disinfection in infected localities. It is merely a matter of some theoretical interest that the plague microbe is so readily killed by this oxidising agent.

8625. Why do you think permanganate would be useless in practice?—Because it is so readily destroyed by organic materials which are abundantly present in all things to be disinfected.

8626. Is it not merely a question of adding a sufficient quantity?—You would have to use such a large quantity that I think it would be impracticable, especially, as in practice, disinfection operations are, to some extent, in the hands of unskilled persons,

8627. Have you examined, for plague microbes, the clothing of people who had plague, or who had died of plague?—In certain cases.

8628. Did you ever find the plague microbe in the clothing?—Never. It must not be understood that I doubt whether the microbe was there. I draw no conclusion of that sort at all. I regard my negative results as simply owing to the fact that we have not yet got a method of detecting the microbe when it is mixed with others.

8629. I understand you obtained the same results as one generally gets when looking for pathogenic microbes in the outside world. Is it not extremely difficult to find them?—Yes, in most cases.

8630. You lay some stress upon the interval which often occurs between the first imported case of plague and the generalisation of the outbreak; do you think that this interval might possibly be accounted for by the fact that it is often very difficult to detect the first and subsequent cases?—In any given instance there is always the possibility that the interval is due to the cases immediately following the first detected case remaining undetected. If only one or two instances were known of a long interval, one would unhesitatingly adopt the theory that the interval was merely due to non-detection of cases. But the more such cases are accumulated, the more doubtful does this theory become. This theory is not one that can be demolished by any one instance, but it is rendered doubtful by the cumulative effect of a number of instances collected from several different outbreaks at different times and places. It is a fact, of practical importance, that in a large number of instances cases following the first importation of the disease have not been detected immediately afterwards, when everyone's attention was aroused, but after an interval of, perhaps, six weeks,

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when one would expect attention to the risk of an outbreak would be less keen.

8631. You base your evidence chiefly on the Hubli outbreak?—Only so far as this point can be proved by a single instance. I have not come to any definite conclusion, but the Hubli case seemed to impress me as a better case than any other that I could quote, owing to the excellence of the organisation for detection of cases, &c.

8632. (*The President.*) I understood you to say the interval may be only a few days, or so long as six weeks?—Yes.

8633. (*Dr. Ruffer.*) In the outbreak at Vienna the first case was easily traced. Did not the two other cases take place almost immediately?—Yes, as one would expect with cases of pneumonic plague, where probably there is direct infection from patient to patient. In the cases we have been discussing there was an infection of the locality which, fortunately, did not occur in Vienna.

8634. What is your opinion as to the incubation period of plague?—I do not think that is a thing I could not give any valuable answer on.

8635. You have no experience of that?—No.

8636. Have you yourself suffered from plague?—I had a mild attack of plague in Agra towards the end of February 1897, having come there from Bombay to collect rats. I had the inguinal, axillary, and femoral glands enlarged.

8637. After accidental inoculation?—There was no definite evidence as to the source of infection. The day before leaving Bombay I had been in a house, where rats had been dying, to collect specimens of mud, &c. The day I left Bombay I had visited a Plague Hospital, and in the interval I had been in my laboratory. I came up here and, finding it cold, I wore underclothing which I had not used in Bombay, but which had been washed there. Here there were many different possible sources of infection. I arrived in Agra on the 22nd February, and was attacked on the 26th February.

8638. Why do you say you suffered from plague—because you had enlarged glands?—Both Colonel Willcocks, I.M.S., and Major Todd, R.A.M.C., who attended me were convinced that my illness could be nothing else than plague. I was segregated on the day of attack, and kept in a grass hut for 16 days.

8639. What were your symptoms?—It was a mild attack. I had very sudden prostration and great weakness, the fever was up to 101°, lasting for 36 hours at that height. There were first inguinal and femoral buboes on both sides, and then axillary buboes on the right side that were painful on touching; the right side was painful without being touched, but the extreme prostration and weakness was very unusual and striking, according to the doctors, and could be nothing else than plague. The buboes did not suppurate.

8640. We have had evidence concerning a good many cases of accidental inoculation with plague, and the incubation period in these cases appears to be from two to four days. Do you think this is a general rule, or do you think that the incubation period may be much prolonged?—I should doubt whether a much longer period of ordinary plague would occur, because in all cases that are given in various books of prolonged incubation periods there is always, it appears to me, a great deal of doubt about the facts. The infection of the microbe might have remained in a man's clothes several days, and then get into the man afterwards, and thus a long incubation period may be apparent not real; whereas in cases in which there is definite evidence, the period is very short.

8641. Have you any experience of Haffkine's prophylactic inoculations?—None whatever.

8642. Have you yourself examined Haffkine's fluid bacteriologically?—I have merely used it in one experiment, which produced immunity in a rabbit.

8643. Have you examined it bacteriologically to see if it contains any impurities?—No.

8644. Have you any experience of plague in vultures?—Although experiments have shown that it is impossible to produce plague in vultures by inoculation, a few of these birds were found ill some time after they had had opportunities of eating plague corpses, but I did not hear of any of them dying. A vulture was sent to me that had been found in the Gwalior Tank Road in Bombay on the 6th February, 1897. It appeared to be quite unconscious, and the only sign of life was a feeble respiration. The man who brought it told me that it had been found in the road unable to fly, and that it had been hit on the head. The liquid oozing from the mouth contained nucleated red blood corpuscles, and microbes similar in appearance to those of plague. I squirted a mixture of alcohol and water down its throat. On the following day it was awake, and during the following days it recovered. On the 9th February it broke its chain and flew away. Dejecta passed on the 7th February contained microbes like those of plague. A trace was inoculated into a mouse which died within 24 hours. No plague was isolated from its organs by culture. Dejecta passed on the 9th February were found to be harmless to mice.

8645. (*Mr. Cumine.*) Of the experiments made to find out the efficiency of disinfectants, were any made upon the actual floors in which the plague bacillus had been searched for, but not found?—Might I suggest that a possible infection of these floors would not bear upon the question whether mud floors can or cannot be disinfected. I used the floor of my laboratory in Hardwar. It was freshly "lepoed" on the particular parts I was going to use. I thus made a floor exactly such as you find in any ordinary infected house. I did not put plague microbes on to it—that would have been a dangerous thing to do—but I contented myself with testing the action of disinfectants on the microbes actually there. It was legitimate to assume that some of them at all events would be as susceptible as the plague microbe, or more so. Some experiments also were carried out in Hardwar on floors that were about to be disinfected, and also on floors of servants' houses in Myapur.

8646. The cowdung in an ordinary native floor neutralises, to a certain extent, I think, the power of the mercury and the acid, does it not?—Yes, both.

8647. I suppose that the cowdung can only neutralise a certain amount of mercury and acid, so that if you put on mercury and acid every day for a week, would not you arrive at a point where the cowdung could no longer neutralise your mercury and your acid, and therefore the excess mercury and acid you put on would be free to kill all microbes?—It is possible that such a limit would be reached.

8648. It is a common thing, I think, in infected villages after the disinfection with the mercury and acid, to put on lime-wash. If a second case occurs in that house, and the house has again to be treated with mercury and acid, what is the effect of the lime-wash upon the second application of mercury and acid?—That the lime precipitates the mercury and renders it inert, and the mercury will tend to render inert the action of the lime; the two will neutralise each other.

8649. (*The President.*) You were asked about acid also?—The acid is also neutralised by the alkaline lime.

8650. (*Mr. Cumine.*) The monkeys got plague. What kind of plague did they get, do you know?—I opened several monkeys, and their glands were enlarged; they had axillary and femoral glands affected.

8651. The bubonic, not pneumonic?—Yes, and the mesenteric glands frequently enlarged.

8652. Did you see any cases of pneumonic plague amongst them?—I could not say. One particular monkey which I mentioned, had a very copious nasal secretion containing plague microbes. I do not think I saw pneumonic plague in any of the monkeys I saw.

8653. I think you said that some of the ants, particularly those that had been eating dead rats, had plague germs. Did they carry about the plague germs with them, or did they get plague themselves?—I am under the impression that these ants did not get plague themselves; but there can be no doubt that in India they aid in the diffusion of the plague microbe from the bodies of rats dead of plague.

8654. (*The President.*) Do you mean carried outside or inside their bodies?—I am unable at present to express any definite opinion on that point.

8655. (*Mr. Cumine.*) Did you make any experiments to find out how long a corpse retained the microbes in an infectious state?—No, but certain experiments I carried out tended to show that the acid in a corpse that develops after death, on the *post mortem* rigidity being established, might conceivably be hostile to the life of the plague microbe, and I suggested that the

point was worth working out. I found that this acid developed in the bodies of mice dead of plague.

8656. Did you make any experiments to find out whether decaying vegetable matter is hostile to the life of the microbe or not?—I may point out, in reply to this question, that to carry out experiments of that nature is really impossible satisfactorily at present, because as yet no test has been discovered for the plague microbe under such conditions. Until that test has been discovered, it is impossible to say what is the vitality of the microbe in grain or in wool or in clothing, and it is even impossible, I think, to give satisfactory evidence as to the activity of different disinfectants until a more reliable method of dealing with the microbe has been discovered. That such a method should be searched for and found appears to me to be of the greatest importance from the practical standpoint.

8657. (*Prof. Wright.*) Are you of opinion that the present methods of diagnosing the plague bacillus are very incomplete? Are you, in other words, of opinion that there are great difficulties in determining whether a culture which is presented to you is a culture of true plague or not?—It depends on the personal equation of the bacteriologist. Unless he has experience of the microbe he may very easily make mistakes.

8658. Perhaps you would tell us what degree of importance you lay on the various diagnostic criteria. Do you, for instance, attribute any importance to bi-polar staining as a differential diagnostic of the plague bacillus?—Not alone. I do not lay stress on any single test by itself. As regards the polar staining it only tends to show that the plague microbe is one of a large group of microbes having this character. The microbe of fowl cholera, for instance, is very similar in that respect.

8659. Do you, in your diagnosis, attribute any importance to the fact of the bacillus retaining or losing its stain, when it is treated by Gram's method? If you have these two characters together, the non-retention of the stain when treated by Gram's method and the bi-polar staining, do you upon that evidence proceed to identify your bacillus with the plague bacillus?—I believe, to a certain extent, that may be done, provided the bacillus is in a specimen made from the gland contents of a suspected case. As regards the plague microbe, it is of importance to note that the unstained area, in suitably prepared specimens is not absolutely unstained, and not always symmetrically placed. It is not such a well-marked polar staining as you get in fowl cholera; and, furthermore, the size of the portion of the bacillus remaining unstained varies in different cases. In such specimens the bacillus has markedly rounded ends. I once found a square-ended bacillus, with clearly marked polar staining, in a specimen from the gland of a suspected case. I was able to cultivate the microbe also, and found it was not plague.

8660. Do you get this bi-polar staining in the case of plague with all stains, or only with particular stains?—All bacterial stains ordinarily used, if the staining is sufficiently right. The polar staining, though present in specimens from glands may be absent or difficult to observe in specimens from blood, and also in the organs of mice dead after inoculation with very virulent plague.

8661. Are you speaking of stains which are applied in heat or in the cold?—Applied in cold. The best method for obtaining polar staining is that of Gaffky. In this method you first wash the specimens with ½ per cent. solution of acetic acid, then with water, and then stain lightly. It is necessary that the film on the cover-slip, after drying and heating, should be allowed to cool before being put in the acetic acid.

8662. What stress do you lay on formation of stalactites? Do you think the fact that they are not produced is evidence that the bacillus in question is not plague?—This is a very valuable test as an ordinary rule, but towards the end of the Jawalapur outbreak, microbes then isolated appeared to have a higher specific gravity and sank to the bottom of the bouillon and so did not form stalactites.

8663. Where obtained, do you think the formation of stalactites a trustworthy diagnostic of plague? Have you seen a formation of stalactites to occur with any other bacillus?—I found a bacillus which made stalactites perfectly resembling those of plague on mere inspection of the culture tube, but if you took up the test tube and shook it, you at once saw that the stalactites, produced by this microbe, were far more resistant and stronger than the stalactites of the plague microbe. They did not become detached from the pieces of fat and hence were easy to distinguish from those of plague. With Haffkine's test, if you take up the flask the stalactites fall like a snow shower; whereas those formed by the other microbe did not fall like a snow shower: they were extremely adherent.

8664. What stress do you lay on the serum test? I think you said that in the cases you spoke of where the bacteria themselves sank to the bottom, you could draw no conclusions from the serum-test. Can you not in such cases draw your conclusions from the occurrence or non-occurrence of agglutination?—It appears to me impossible to get any such reaction where the microbe itself sank to the bottom, or sedimented in this way.

8665. Did you find that mice and rats develop buboes when they are inoculated with the plague?—It is a general rule in these smaller animals that you get enlargement of the spleen and the glands in many diseases, and any enlargement that may be present in plague has no diagnostic value.

8666. So you think that you cannot in rats and mice lay any stress upon the fact that swelling occurs in the lymphatic glands?—No.

8667. Do you lay any stress on the specular appearance by reflected light which is obtained when the culture is held away from the light, and when it is looked at from the back?—I lay no stress on that character. You do not always get it in such a complete way as we got it in cultures, isolated at the commencement of the outbreak in Bombay. Further, I have found so many microbes which are not plague microbes but which give this effect.

8668. You attribute, do you not, a great deal of importance to the development of involution forms?—I believe that that is a practically valuable test, for a culture isolated from a suspected patient, and that it should be used if a further proof is required whether or not the culture is of plague. But if plague has been kept for a long time in culture in laboratories, it may lose this power of producing involution forms.

8669. Do you attribute great importance to the stickiness of the culture?—I found that attenuated plague microbes in my laboratory in Bombay were no longer sticky, but after making four or five passages through mice they gradually regained this character of being sticky or adhering to the needle. At the end of the Jawalapur outbreak the microbes were not sticky, or only slightly so. During the preceding outbreak in Hardwar they were as sticky as in Bombay.

8670. You say you examined some mud from Kankhal and you inoculated some mice and got a bacillus which resembled plague; and you say you afterwards differentiated the bacillus from the plague bacillus?—Yes.

8671. What is the evidence that made you come to the conclusion that the bacillus you were dealing with in this case was not plague?—I found the same microbe afterwards in two out of six dead rats sent to me from Bareilly, and so far as I am aware there is and has been no plague in Bareilly.

8672. Then do you say there is a microbe which kills rats and mice which is not plague but which may readily be mistaken for it?—It is a microbe that I found in these two experiments, and I may have met with it in other experiments while searching for plague microbes elsewhere though I have made no definite records. In these two cases I found this microbe and it looked like coli under the microscope, but when cultivated in rat serum it changed in its appearance and shape and looked very much like plague.

8673. Supposing that I were to take up the position that the bacillus which you found in the mud in Kankhal was a plague microbe, how could that inference of mine be refuted? You say it looked like coli, but was it tested in other ways—for instance, by the serum test—to see whether it was plague or coli?—The microbe was tested with a negative result, the second microbe I got out of the Bareilly rats, which there is no reason to associate with plague. Owing to the possibility that the microbe was some altered form of the plague microbe, I was extremely interested in

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the case of the mud from Kankhal, and I did a great deal of work in its investigation. I inoculated 20 or 30 mice, and made a very long series of cultures, and I found that it was generally harmless to mice or rats. It appears to be a microbe allied to the virus danyz.

8674. Might not the bacillus have been a non-virulent plague-bacillus? Did your bacillus give the stalactite form of growth or any other of the characteristics of plague?—No, it had not any of those characters of growth; it grew with very rich and luxurious cultures on agar, like the virus danyz. It was far too vigorous growing for plague, and it did not produce anything like stalactites, but an uniform turbidity in bouillon.

8675. You said that plague dies out in rats: can you tell us after how many passages through rats does the plague bacillus become attenuated?—I did these experiments in Bombay with fully virulent plague, and in Hardwar where I was working with somewhat attenuated plague. In each case after the third or fourth passage the rat remained all right. Dr. Roux found the same thing at the Pasteur Institut.

8676. I do not know whether it is within your experience that an epidemic of rats always results in an absolute disappearance of every rat. Does that observation harmonise with the suggestion that plague becomes attenuated by passing from rat to rat?—In an epidemic affecting rats I suggest that it is by no means certain that the epidemic spreads from rat to rat, and that there is no other mode of infection.

8677. Do you say that the plague microbe does not become attenuated in passing from mouse to mouse?—Yes, on the contrary it became more virulent by passages through mice. The curious paradox is that in Bombay the mice remained all right and the rats died.

8678. Have you any reason to suppose that a microbe which is not virulent enough to kill a rat may kill a man?—Only the curious fact given on the authority of the German Commission that they found that a microbe that could not kill a mouse could kill a monkey. This result may have to do with the quantity employed.

8679. You say that in many cases you are not able to find any plague microbes in animals which have died of plague?—Yes.

8680. Were the animals you speak of examined after death?—Not only immediately examined after death but in certain cases I killed the animal while it was still alive and found no traces of plague. It is a matter of inference that they died of plague, as in Dr. Simond's experiments. In three cases mentioned by Dr. Sticker, of the German Commission, he had found the plague microbe during life, in the blood of the patient, but not a trace of the plague microbe in the patient, or in the blood of the patient, after death, proving that the microbe had been there, but had vanished. They examined the patients immediately after death. Dr. Sticker points out the great instability of the plague bacillus in specimens of plague material they brought back preserved in alcohol, formalin, &c. Though they were full of plague microbes originally, when he cut sections not a single microbe was to be found.

8681. You have suggested that the microbes die out after death owing to the acid being developed in the body?—I suggested that it might tend to limit their vitality.

8682. Does the blood of an animal become acid after death?—I do not suggest that the blood would become acid immediately, but the muscles become acid in the development of *rigor mortis*. I took the trouble to examine mice dead of plague, and I found the total acid present fully equal to the total acid present in mice killed by a blow on the head.

8683. Did the plague microbes in a dead mouse come in contact with the acid which is developed?—As decomposition advances I suppose that the acid substances might more or less diffuse from the muscles into the blood. I only put it forward as a suggestion.

8684. You have no facts, have you, which show that the blood does actually become acid after death?—No, it is merely an inference.

8685. When you examined these monkeys with plague did you find any superficial wounds in the hands or legs, or in the regions of the trunk which are in connexion with the glands which had become inflamed?—In no cases.

8686. Did you look for such superficial wounds?—Yes, I looked over the skin of these monkeys in certain cases.

8687. Do you think that the practice of lime-washing is of any service at all in disinfecting houses? Do you think it would be better to omit the lime-washing?—I think it would be far better left out, as it would tend to neutralise the action of any more valuable disinfectant that might afterwards be used. It has a very temporary action, and in the conditions that exist in India the lime very readily loses its disinfecting qualities.

8688. (*Dr. Ruffer.*) Do you mean to say the white-washing is often done with lime which is not actually caustic?—Yes, I believe this occasionally happens.

8689. (*Prof. Wright.*) I referred to the conditions under which whitewashing is actually done in India. Do you, taking these things into consideration, think that it works better to omit the limewashing?—Yes.

8690. Do you think the best way of disinfecting the floors is by burning them? Further, do you think that a fire ought to be lit on the surface of the floor, or do you think the floor ought to be dug up, so that it should afterwards be burned?—Where practicable it would be best to light a fire on the floor *in situ*. In small villages of mud huts it would be better to set fire to the thatch and let it fall in. If the mud floor is dug up and burnt outside there is a risk that the workmen would become infected, and a certainty that the work would not be completely done, in that small particles of dust and dirt would fall on the road or be blown about by the wind and so escape disinfection. The ideal method of carrying out disinfection on occurrence of plague would be as follows:—If a case occurs in a house that house and the surrounding houses should be evacuated. The evacuated houses should then be set fire to, beginning at the edges of the evacuated area and burning in towards the centre. If only the house known to be infected is burnt, plague-stricken rats may be driven from the infected house to neighbouring houses. But by thus making a circle of fire and burning from the edges towards the centre there would be some chance of destroying the infected rats. On the first appearance of plague in any country previously free from the disease it would be well worth while to take this strong measure. Where plague has established itself, on the other hand, practical considerations will often prevent such thorough measures of disinfection from being taken.

8691. Have you made experiments to determine whether plague can be acquired by the intestinal canal. Have you, for instance, succeeded in infecting animals with plague by the mouth?—I found that fully virulent plague would infect rats, when fed with it.

8692. We have had it in evidence that a series of rats were fed upon bags of corn which were highly infected with plague without any evil results supervening. Is that in accordance with your experience?—I have done experiments with similar results, but it depends very much upon the quantity and on the virulence of the microbe. I believe you want a very small quantity of grain and a whole culture of the microbe fully virulent, in order to obtain a positive result.

8693. I think that you have called attention to the fact that the prostitutes in Bombay did not suffer from plague, is that so?—In my paper in the "Annales de l'Institut Pasteur," I have simply summarised the facts known, not only in Bombay, but also in other epidemics. I had only heard of one or two cases of prostitutes getting the plague in Bombay. It is men-in Dr. Weir's report* as a case of curious immunity.

8694. Does it suggest itself in your mind the fact that syphilis may in some way protect against plague?—I know no *à priori* reason why this should be so, but a London practitioner practising at the time of the great plague of London, 1665, Dr. Boghurst, stated that if people were suffering from syphilis they usually recovered from plague, and a widespread belief arose in London that syphilis protected against the pestilence, and he had heard of people getting inoculated with syphilis in order to be protected against plague. The Arabs in Bombay, I am told, also stated that syphilis was the one thing that made people safe against plague.

* *See* Report on Outbreak of Bubonic Plague in Bombay, 1896-97, by P. C. H. Snow, Esq., I.C.S.

8695. It has been stated that articles which do not contain any living plague bacteria may cause death when they are inoculated into animals. Have you experiments or experience with regard to that matter?—It is generally admitted that the drying of films on cover glasses kills the microbes within a very few hours. I inoculated certain films, made some days previously from the glands of patients, sub-cutaneously into rats, and found, as had other observers, that rats under these conditions remained absolutely unaffected. I carried out a large number of experiments with this same negative result. But, guided by certain theoretical considerations, I tried the effect of inoculating minute pieces of these films into the trachea of rats, and I found in certain experiments that rats would then die, whereas other rats similarly injected in the trachea, but protected by doses of plague anti-toxine, remained all right.

8696. Do you draw an inference from that that there were really live plague bacteria in these dried films, or do you infer that the films contained toxins which had been elaborated by the plague bacillus, and that it was these which caused the death of your animals?—It is extremely difficult to arrive at an opinion. Films made from cultures I found to become rapidly harmless to rats, even on intra-tracheal injection.

8697. Have you found any bacteria in the bodies of the animals which died in consequence of the inoculation of these dried films?—It was absolutely impossible to see any microbes with the microscope suspicious of plague, or to obtain any suspicious cultures from the bodies of these animals, and, on the other hand, since writing the précis of my evidence, I have read a paper by Wernicke, who found that by drying agar cultures and further treatment he was able to extract a poison that was so virulent to guinea pigs that one twenty-five-thousandth part of the body weight was fatal, and by another process, that one seventy-two-thousandth part of the body weight of the poison was fatal to mice. An analysis of the paper is published in the "Centralblatt Journal fur Bacteriologie," Vol. XXIV., page 859.

8698. (*Dr. Ruffer.*) From plague cultures?—Yes.

8699. (*Prof. Wright.*) Are these facts, in your opinion, borne out by the result which Lustig and Galeotti obtain by the inoculations which they make with a view to producing a curative serum for plague?—To some extent. But Wernicke completely failed to obtain an useful anti-toxine by the use of his poisons.

8700. Have you found, as a matter of fact, that rats are more susceptible to plague when they are inoculated upon the mucous membrane of the nose than when they are inoculated hypodermically?—No; in certain cases I have inoculated attenuated plague into rats, putting some in the nose, and found that the animal was not more susceptible to this mode of infection.

8701. But you employ, do you not, a method of inoculating rats by the trachea?—Merely what I have just told you about these dried films for diagnostic purposes.

8702. Have you tried to insulate living plague bacilli by this method?—I have once or twice, but I have not tried a course of experiments. It is merely a question of these dried films. I cannot give any definite conclusion,

8703. Then you are not in a position, are you, to confirm the opinion that rats are more easily affected by the mucous membrane of the respiratory passage?—No, I somewhat doubt it.

8704. Have you come to any definite opinion as to the rôle which rats play in the case of an epidemic of plague? Do you think they have played an important part in spreading plague?—It appears to be very probable *à priori* that in a large town like Bombay, where buckets full of dead rats could be picked up every day in the infected quarter of the town at the commencement of the epidemic, that these ambulatory plague cultures should have exercised some effect, more especially as in a tropical climate these dead rats are rapidly pulled to pieces by ants and other insects which carry the microbes all over the house. But this risk is only known to be operative at the commencement of the epidemic. The epidemic among men continues long after any sick rats are to be found.

8705. Have you examined many of these rats in order to determine whether they have actually died of plague?—I have examined several of these rats both in Bombay and in Kankhal, and only a certain proportion of the rats examined were found to contain plague microbes. That is to say, in these instances, only a certain proportion of rats found dead appeared to be capable of spreading the infection. There is one point—I do not know whether it has been brought out in evidence—namely, the susceptibility of grain dealers at the commencement of an epidemic. In the Pali outbreak of 1836 it appears to have been noticed that after many people had fled from the town of Pali into the surrounding villages that the plague did not at first break out on their arrival in the villages; but that after an interval of several weeks it did break out in the villages to which they had come—not necessarily in the houses which had received them, but in the houses of the grain dealers.

8706. What is the evidence upon which that statement is made. Do you know from what source it is drawn?—I think it is from Mr. Nathan's Report.*

8707. Have you any facts which tend to prove or disprove the association between the incidence of plague and bad sanitary conditions? Have you formed any opinion with regard to this matter?—The relation between bad sanitary conditions and plague appears to be by no means so clear in the case of plague as it is in the case of some other diseases. I am inclined to suspect that the influence of these conditions is indirect more than direct, in that places in which such conditions prevail are in many cases more likely to harbour rats. Bombay and Poona Cantonment suffered more severely than Calcutta and Poona Town, though the former are far cleaner places. In both Bombay and Poona the second epidemic was more severe than the first, despite the sanitary improvements that had been introduced meanwhile. So far as the influence of personal cleanliness is concerned, it may be noted that in Bombay Hindus suffered more than Muhammadans, though the latter are less cleanly than the former. During the first few weeks of its prevalence in Bombay, the disease was almost confined to members of certain castes who habitually take a bath twice a day, but these were chiefly graindealers, and their houses were infested with rats. With regard to overcrowding, it may be noted that the most sparsely inhabited districts of Bombay—Sewri, Parel, and Mahim—were among those most severely attacked. Of houses condemned as unfit for human habitation in Bombay, less than nine per cent. were situated in wards "F" and "G," which suffered far more severely than the other wards from plague. Monkeys in Kankhal suffered, in proportion, more severely than human beings, though these animals never enter ill-ventilated houses, get good food, and are not overcrowded.

8708. How many monkeys died?—I think 30 or 40 monkeys were found dead, but it is probable that a greater number were attacked.

8709. Can you say how long plague bacteria may thrive in clothes or grain? Can you fix any limit?—With existing methods it is impossible to make any statement whatever on this point.

8710. Have you any facts bearing upon the disinfecting power of the sun?—I have not carried out any experiments of that sort.

8711. There seems to be a very general belief in the disinfecting power of the sun, in India particularly; do you share that belief?—It is merely a question of general grounds. It is a known fact that the sunlight can produce disinfecting action in cases in which oxydation and evaporation can occur under its influence. I should scarcely expect a plague culture in bouillon to be destroyed by exposure to sunlight readily, but I should expect, on general grounds, that the same culture, if poured out on a thin glass plate, and exposed to sunlight, would be very rapidly destroyed, because then rapid evaporation in the presence of sunlight would occur, which condition is known to produce hydrogen peroxide, and to be thus harmful to bacteria.

8712. Would you expect *à priori* on those grounds that bacteria which had been slowly dried, for instance, on wheat or other corn, would be destroyed by exposure to the sun?—It would depend upon the temperature a great deal, but, on general grounds, one would expect such disinfection to occur.

8713. (*Dr. Ruffer.*) When you inoculated cover glasses covered with a film of plague in the trachea

* The Plague in India, 1896–7, compiled by R. Nathan, I.C.S.

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of rats, did you find the bacilli in these rats afterwards?—Not a trace of bacilli.

8714. How long after did you examine the rats?—In certain cases I found the rats dying, and choloroformed them. In other cases I found them when in *rigor mortis*, and, as a rule, my examination must have been carried out very soon after death.

8715. As to the morphological appearance of the plague bacillus, have you ever seen a capsule of plague bacillus?—No.

8716. Have you tried to demonstrate it?—No.

8717. How about involution forms on ordinary cultivating medium on agar; how long is it before they appear?—It varies very much with the age of the agaragar; it may take three or four days. With the salt agar that I have recommended, the involution forms will develop in 24 hours if the culture is kept in the incubator.

8718. Do they appear sooner in bouillon?—They are not formed at all in bouillon.

8719. Do you get them in gelatine?—I think not, but in this country I can only work with liquified gelatine, which is similar to bouillon. In both these media the bacilli form long delicate tangled skeins.

8720. Did you find them in the precipitate which falls to the bottom of a flask of bouillon inoculated with plague?—I do not clearly recollect searching for them, but I do not think that they were present.

8721. Is there any compulsory examination of prostitutes in India? I ask you that because of the bearing on syphilis. I want to know whether there is much syphilis in the prostitutes?—I could not give you any opinion on that point.

8722. Have you any evidence as to the disinfecting action of a 5 per cent. liquid carbolic soap?—In the letter I have put in, experiments with lysol are mentioned which consists of soap mixed with phenols.

8723. But not definitely with carbolic soap?—No.

8724. To go back to your experiments with antiseptics, when you mixed the culture with the antiseptic and then made your sub-culture from the mixture into another tube, how much did you sow in the second tube? Did you take one c.c. or ½ c.c.?—I probably took 1-80th or 1-100th c.c. It was a very small quantity and much diluted. That was the way I attempted to get rid of the possible action of any traces of antiseptics carried over. There was a great deal of dilution.

8725. A loop-full, I suppose?—In these experiments I used a fine capillary pipette, and the liquid was allowed to run up a very small distance in it to a measured mark; I had definite quantities for each experiment.

8726. (*The President.*) I understand you to have said, that while you think any single characteristic of the bacillus is in itself insufficient, a combination is enough to allow you to come to a certain conclusion. If you get all the characteristics that are generally trusted to could you then arrive at the conclusion that you certainly have the plague bacillus?—Yes; undoubtedly, by carrying out a sufficient number of tests, I could arrive at a completely definite conclusion.

8727. Having made the whole series of tests, you would have no doubt?—Yes.

8728. Have you made experiments with the antitoxine properties of the serum of plague cases?—I have merely used plague anti-toxine in order to produce immunity in rats for experimental purposes.

8729. Which anti-toxine was this?—Roux's.

8730. I mean from plague patients or from animals who have suffered from plague; have you quantitatively tested the anti-toxine value of this serum?—No.

8731. Or the anti-toxine qualities of bile?—No, I have not.

8732. You think that plague virus introduced by the digestive canal is active?—I made the suggestion that it was only under very unusual conditions that one could have infection in that way.

8733. Have you made any observations?—The purport of my observations was that under ordinary conditions the animal would be quite immune to plague administered by the intestine. It is only when exceptionally virulent plague and very large quantities are used that a positive result is obtained.

8734. If an acid is very hostile to the activity of the bacillus, of course the bacillus which enters the stomach would be to some extent rendered ineffective?—It would be to a great extent destroyed by the gastric juice if the latter was present at the time.

8735. A much larger dose would be required by the stomach than by subcutaneous injection to produce the same result?—Yes.

8736. I did not quite understand about the decadence in the virulence in transmission through rats. You said that inoculations had been carried on for three or four series?—I should have said that the third or fourth rat of the series of passages would remain in good health—the third rat might die, but you would only see in its tissues very few microbes that could be taken for those of plague.

8737. In the third series or passage?—Yes.

8738. The contrary effect was produced in passages through mice. Can you tell me how many passages were required to restore the original virulence?—You would get no further effect after five or six passages. At the fifth or sixth passage through mice you would have the maximum virulence for mice. In stating that I am repeating the experiments of Yersin, besides my own.

8739. You said something about the influence of hygienic conditions on the propagation or virulence of plague. I think you instanced the monkey as having suffered in some localities although exposed to sunlight and amply provided with fresh air. Suppose you had a monkey or monkeys confined in an ill-ventilated place, have you any observation to show then how they would be affected?—I have made no experiments on that point.

8740. What would be your opinion?—As a matter of fact they did confine many hundreds of these monkeys in cages in Kankhal, and there they were in relatively unhealthy conditions, and there they did not suffer from plague.

8741. Were they exposed to plague infection?—I think one or two died of plague in these cages, but I am not sure. Other witnesses will be able to inform you.

8742. The monkeys were not allowed to come in contact with each other?—There were very much in contact with each other—several hundred in a cage.

8743. In one single cage?—Some of the cages were very large and overcrowded, but apparently the plague infection did not spread through the cage as one might expect.

8744. Although individual monkeys had the infection?—I am under that impression. I am not definite on that subject. I have had various specimens from monkeys that died in these cages, and in two of them I found appearances identical with those of plague.

8745. Were those from the monkeys which were together in the cage—you said a number were in a single cage?—I have not got any definite recollection, but I believe that one or two plague cases did occur in the large cages.

(Witness withdrew.)

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8746. (*The Chairman.*) You are in the Indian Medical Service?—Yes.

8747. What are your medical qualifications?—M.R.C.S., L.S.A., D.P.H. Cambridge.

8748. You are Sanitary Commissioner?—Yes, of these Provinces.

8749. (*Mr. Hewett.*) Can you tell us what arrangements you made when plague broke out in Bombay—to prevent plague from getting into these Provinces?—In the spring of 1897 it being clear that there was a risk of introduction of disease from Bombay, plague preventive operations were put in force throughout the Provinces. Authorities had been warned before, but, in

February 1897, the Plague Regulations were authoritatively issued. The original rules were substantially the same as those now in force, although the stations watched for possible plague cases have been somewhat altered as circumstances demanded. Thus, for instance, certain stations had to be watched while plague was prevalent in Calcutta, though this procedure is no longer necessary.

Part I. of the Plague Regulations related to:—

(1) duties of proprietors of land,
(2) duties of the police,
(3) duties of the revenue staff,
(4) duties of the famine relief staff,
(5) duties of the medical staff,
(6) duties of the public.

These principally dealt with the prompt reporting of cases of the disease. Part II. dealt with the action to be taken in Municipalities, towns under Act, XX. of 1856, and Cantonments, not only on the appearance of plague, but also in anticipation of the same; while a memorandum by the Sanitary Commissioner described the symptoms of the disease and the procedure to be adopted in villages and small towns. The last was widely distributed for guidance. Part III. dealt with the procedure to be adopted for watching the rail-borne traffic from infected areas, and specified the duties of the various officials concerned. At four stations—Jhansi, Saharanpur, Ghaziabad and Manikpur—European medical officers examined every passenger; such passengers being paraded for the purpose. Later on, the inspection station at Manikpur was removed to Sutna. In addition to these stations, alighting passengers were examined at the nine most important stations by Hospital Assistants, and the same procedure was carried out at 31 less important centres of population by vaccinators. Subsequently the number of these stations was increased as experience indicated the necessity. Special arrangements existed at Haldwani, Hardwar, Rurki and Lhaksar. To ensure that such inspections were really efficiently carried out, three travelling Inspectors were appointed, who moved constantly all over the railway system of these Provinces, and who submitted weekly reports to me detailing any instance of neglect of duty, or want of proper arrangement for the accommodation of possible patients. Some special Health Officers of towns (Staff Corps officers) also made frequent tours for the same purpose. Passengers from infected areas were required to give their address to the special police staff at the stations, and information was then forwarded to the Magistrate of the district to which the traveller was proceeding. Recently, in consequence of passengers with fever, not believed to be due to plague, being permitted to proceed on their journey subject to their medical examination on arrival, it has been found necessary to place Hospital Assistants to examine such passengers at Aligarh, Moradabad, Bareilly, Shahjahanpur, Bindhachal, Fyzabad, Tari Ghat and Rampore. In both 1897 and 1898, in consequence of the decline of plague it was found possible for a short period to relax the rules in force for the examination of passengers at the smaller stations, but travellers to the more important centres of the Provinces were always watched on arrival.

8750. Was the object of these inspections to detain people from the infected area who had suspicious symptoms?—Yes, people with high temperature or other suspicious symptoms. If there was anything suspicious about them they would be taken to the observation hut and kept under observation till it was determined what was the matter.

8751. What did you do with the people who came from an infected area who had not suspicious symptoms?—With regard to Hardwar or where there was a big fair on, such as Benares or Allahabad, all persons were examined as they alighted, and those who came from infected areas were specially dealt with. Many important religious fairs occur in these Provinces, and have been sources of much anxiety. Especially was this the case at the time of the solar eclipse in 1898. Hardwar, Benares, Ajudhia, Bindhachal, the Magh Mela at Allahabad, &c., are visited by pilgrims from all parts of India. The procedure adopted was to form special camps near the fair site for the reception of pilgrims from infected areas. All trains were met by Assistant Surgeons and Hospital Assistants and all passengers examined on alighting; pilgrims from infected areas being conducted to the special camp and required to live and cook their food there. They were allowed to bathe at the ghats and buy food, &c., but were examined medically night and morning at the camps. Their clothes were disinfected on arrival. The camps were comfortable and the scheme worked well and without friction. In the case of certain large fairs, booking to the locality from infected areas was prohibited. The sanitary condition of the fair site was very carefully attended to, and special officials patrolled the fair regularly to watch for cases of concealed disease. The latrine accommodations, general and infectious hospital construction, and other details were all carried out under a definite and carefully considered system. No case of plague occurred at any of these fairs, except in the case of Hardwar in 1897, and here disease was not introduced, but was actually present before the inception of the arrangements. In other cases where there was no special arrangement or where there was no fair on at the time, pilgrims were simply examined like any other passengers.

8752. Did you keep any watch over the people who came from infected areas who had not suspicious symptoms, after they had gone to their homes?—There was no watch kept over them unless their names had been telegraphed on from Jhansi, we will say, or from one of the inspection stations. If a passenger had come from an infected area or not the Magistrate of the district to which he was travelling was telegraphed to, and informed that a certain passenger had got a ticket for such and such a place. The Magistrate had then to watch the individual, not only if he were going to a town but also if he were going into a village.

8753. Were any persons suffering from plague removed from the train at any of these medical inspection stations?—Two, one at Bareilly, and one at Agra. There was a doubtful case at Gonda. There were two undoubted cases detected at the stations, they were bubonic cases, and both proved fatal. This may seem a small result, but the preventive action of train inspection is very great. It can never be known how many infected persons, or persons actually sickening with plague, would have swarmed all over India, but for the knowledge that they would be subjected to inspection on arrival in fresh localities.

8754. Had you any other imported cases of plague which were detected before the outbreak at Hardwar?—Fifteen cases of plague (other than those occurring in the Hardwar Union) were reported in these Provinces in 1897. Of these eight occurred in large cities. Precautionary steps were taken, and no secondary cases followed. Only seven cases were reported from the districts; but it is quite possible that others occurred of which intimation was not given. From inquiries made while on tour, I am inclined to think that the extensive circulation of information as to the symptoms of plague and action to be taken, may have led to the adoption of the proper procedure of isolating the sufferer, in some cases where no report was made of the incident.

8755. They were single imported cases?—Yes.

8756. What did you do in those cases?—In those cases we segregated the people who were with them. We disinfected the houses, and sent the patients to the Plague Hospital and certain of his friends.

8757. Did the disease extend to other persons in any instance?—No. I think altogether there were only 15 of those cases; but in no instance did a secondary case occur. A child died in a train between Jhansi and Cawnpore, and we got news of it, and the corpse was taken out at Cawnpore. They tried to take it across to Lucknow: but it was stopped, and the body burnt. Following up that case, I found that among the party which had gone round by rail another case had occurred in Lucknow city, and had been buried. That was a Muhammadan. However, we got all the people into camp at once, and disinfected the grave, and nothing further happened; no further case occurred.

8758. You have prepared a printed précis of evidence about the plague in Hardwar. I understand you to say that you leave a description of the details of the outbreak at Hardwar to the local officers?—Yes, I have only given a sketch.

8759. I will take you through that. I understand you were at Hardwar at the time plague broke out in 1897?—Yes, I was in charge of general sanitary arrangements for the big fair in the spring.

8760. You had a very large fair there then?—It was calculated at about 200,000 people.

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8761. Do you think that the case of plague which came to your notice on the evening of the 8th of April 1897 was the first case which took place in Hardwar?—No; because, as a result of the detection of this case—the woman died, and the police reported it—we made inquiries, and found she had left another house two days before; and on inquiring at that house we found a woman, a lodging-house keeper, lying there who had recovered from the disease, but who was exceedingly emaciated and in a very reduced condition, with two suppurating buboes.

8762. Where did the woman you first found come from?—She was a servant in the house of the lodging-house keeper, and, I think, came from a village in the immediate neighbourhood of Hardwar. She had been for some time in the service of this lodging-house keeper, whom we found lying there with the suppurating buboes.

8763. Who used to come to lodge at the house of this lodging-house keeper?—Sindhis. Nearly all the lodging-houses there are kept for particular classes of people. One lodging-house keeper will take people from Sind; and another, perhaps, from the Central Provinces; Bombay people would go to another, and so on. The people who went to this lodging-house were all Sindhis, more particularly from the neighbourhood of Karachi.

8764. Had they got to this lodging-house after being subjected to the special arrangements with regard to pilgrims from infected areas?—This occurred on the 8th of April, and we were of opinion, from the appearance of this woman and from what subsequently transpired, that probably disease had been in Hardwar for something like a month at least. I think one cannot say that the general arrangements in the Provinces had been enforced before certainly the end of February; so that I do not think there was any real efficient check.

8765. Have you any evidence which might tend to show that the infection came from the Hills?—The first thing that occurred to me when I found this case was the probability that it might have come from the Hills, and I made as careful an inquiry as possible. No Hill men frequented this lodging-house. There were very few Hill men in the place, and I could not find the slightest evidence of there being any connexion between the Hills and this outbreak; whereas there was very strong presumptive evidence that a number of people had been frequenting this lodging-house from Karachi, where the disease was very bad at the time, and undoubtedly this woman, the proprietress, was suffering from it.

8766. Did the pilgrims disappear without any infection spreading among them?—There was not a single case, as far as I know, among them. A supposed case in the Punjab was, I think, never proved.

8767. Did you discover any further cases then?—A systematic search followed, and other cases were discovered within a short distance from the original one. The block of buildings in which the cases were found was then evacuated, and the whole town cleaned up. Scattered cases at first occurred in different localities, but when the town had been free from 22nd April to 15th May, it was hoped that the outbreak was over. But on May 16th one Kishan Ram, a priest in a temple in the sacred pool, was attacked. The case was peculiar. The offerings at the shrine were kept in the block of buildings infected with plague. All the goods in this block could not be disinfected at once, and the order was that the owner of the goods was to be present at the disinfection to avoid theft. Kishan Ram went to see the vestments disinfected on the 7th May, and the work not being over by dark, he either slept on the clothes in the verandah, or actually in the room in which they had been stored when plague broke out. He was attacked on the 14th, and was taken to Kankhal, where he died on 16th. As regards his seizure, strong suspicion exists that he contracted the disease from the clothes in the infected block. No other explanation could be found.

8768. You only evacuated a portion of the town?—All, with the exception of one or two cases. The outbreak was entirely confined to a large block, with an area of some 5 or 6 acres, and it was very easy to cut off the whole area from the rest of the town. I think there were only three or four cases which occurred outside that block.

8769. Did you evacuate any part except this block?—We evacuated that block, and then evacuated the actual house and a small area round the house in which any subsequent case occurred outside that block.

8770. Plague ceased in Hardwar at the beginning of June, I think?—Yes; the last case was on the 8th of June.

8771. How far is Kankhal from Hardwar?—About one mile.

8772. Were there any arrangements, while the outbreak was going on in Hardwar, to prevent intercommunication between Hardwar and Kankhal?—Nothing in the way of quarantine. We had special officers watching both Kankhal and Jawalapur, and both towns were very carefully cleaned up and kept in a very good sanitary condition, but it was quite impossible to close Hardwar from Kankhal, because a very large number of the inhabitants of Kankhal come daily to Hardwar—priests and others.

8773. Shortly after the outbreak ceased in Hardwar, did you have any reason to suspect that an outbreak might be imminent in Kankhal?—Nothing whatever made us suspicious until the rats began to die.

8774. When was that?—That was in the middle of June. I went down there and investigated the matter. The last case occurred in Hardwar on 8th June. But about the middle of the month ominous rumours reached the authorities that rats were dying in large numbers at Kankhal, a town of about 6,000 inhabitants and one mile away. No case had occurred in Kankhal, though a beggar had died in a garden on the outskirts, and the priest Kishan Ram I referred to just now had been taken sick from Hardwar and had actually died in a house in Kankhal close to the Satighat there. The death had been reported, and the whole house disinfected at once. No further cases had followed. I investigated the reported mortality among rats on the spot immediately, and although the reports were no doubt exaggerated, unquestionably an unusual mortality had occurred. I considered it probable that the rats had become infected by grain, sweetmeats, &c., taken by Banniahs fleeing from the infected block at Hardwar, as it was known that on the first panic occurring, many Banniahs had removed their stores under cover of darkness to Kankhal. No outbreak among men, however, immediately followed that among rats; all practicable measures were taken, and it was hoped with success. July and August passed without anything happening to cause alarm. All three towns of Hardwar, Kankhal, and Jawalapur were, however, kept under observation as far as possible by specially appointed officers, and particular attention was directed to their sanitary condition. In the first week of September there were rumours, at first uncredited, that plague had appeared in Kankhal, and on the 16th an undoubted case was discovered close to the Satighat and within a couple of hundred yards of the house in which the priest Kishan Ram had died. Other cases followed in the neighbourhood. The Satighat block was evacuated, but fresh foci appeared in different muhallas, and although each block was evacuated as it became infected, the disease cannot be said to have been really in hand until practically the whole town was deserted and the people placed in camps. Over and over again when an area of some acres had been evacuated and buildings disinfected, fresh cases would occur in houses immediately adjoining the evacuated block. It was abundantly clear that the rats were very largely infected and the disease even spread to monkeys.

8775. Perhaps you can give us some information as to the manner in which Kankhal became infected?—The town is only one mile from Hardwar, and intercourse between the two towns is regular and constant. But whereas the last case had occurred in Hardwar on June 8th, plague is not known to have been in Kankhal among men until September 16th. It is, of course, possible that Kankhal was re-infected from Bombay or some other place than Hardwar. I can find no evidence of this having occurred. The second theory is that the rats were primarily infected by eating infected grain, sweetmeats, &c., brought from Hardwar, and the course of events lends some colour to this view, as the epidemic among rats bridged over the interval between the two outbreaks. There is a third theory however. The priest Kishan Ram had been brought sick from Hardwar and had died of plague in a house near Satighat in Kankhal. When we investigated the first known cases in Kankhal in September we obtained inconclusive evidence of several recent very suspicious deaths having occurred in the immediate vicinity of

the first case actually verified as plague. The house in which Kishan Ram had died had been thoroughly disinfected and had not been occupied since. But we ascertained that he had relieved himself just outside the house in a locality from which a small drain ran for a short distance down to the Satighat. Kishan Ram died in the hot weather when this little drain was dry; when the cases occurred in September the drain was running. I had some mud taken from this drain and examined bacteriologically, but no plague bacilli were found. I am not inclined to attach too much importance to the theory, but it is conceivable that germs lay dormant in this dirty ground until moisture revived them and rain washed them down to the ghat. It is certainly curious that at first plague confined itself in this large town entirely to the immediate vicinity of the only spot concerning which there was evidence of former infection.

8776. You only evacuated a portion of Kankhal at the beginning; was that measure effective?—It was not. We took, in fact, just the steps which we had taken in Hardwar; we evacuated the block in which the first cases had occurred, but we had hardly done that when other parts of the town began to be attacked. Although we took block after block as fresh houses became infected and evacuated them, I cannot say that we got a hold of it till the town was all out in camp.

8777. When did it cease?—It ceased in the middle of the cold weather, on the 26th December. We thought, perhaps, for that reason the measures had been, to a certain extent, effective.

8778. Had you any peculiar difficulties in Kankhal as regards monkeys or in any other way?—We had a great many difficulties and the principal difficulty, of course, was the monkeys.

8779. Can you tell us about that?—I am afraid I have not the dates, but what happened was, that some time at the end of June—I went up there about that date—monkeys were noticed lying dead about the town with enlarged glands. Some of these glands were sent to Mr. Hankin and he found the plague bacillus in them. Then we took measures to catch as many of those monkeys as we could, and I think we caught about 700 and kept them under observation, as we should have kept human beings. After a lapse of ten days without a case occurring in any particular cage, the monkeys were taken to the jungles about 15 miles away and released. I think, as a matter of fact, only one monkey contracted the disease in the cages.

8780. Then, I think you had another difficulty with regard to infected clothes being walled up when the houses were disinfected?—We had cleared out the town and got everybody into camp, and were simply disinfecting the town to enable the people to go back as soon as possible when we discovered there had been systematic concealment of clothes, very often in houses in which disease had actually occurred. People had walled up niches and odd corners of the house and whitewashed the wall, so that it was only accidentally discovered in consequence of a theft. Someone knew of these clothes having been walled up, and the police made an inquiry and broke into one of those receptacles. That led to a general search throughout the town, and a large number of those places were discovered full of clothes and other things, in some cases the property of actual plague patients.

8781. Did infection spread from Kankhal to any other place?—Yes, it spread to several villages in the neighbourhood. I remember the first village attacked was Jagjitpur, which is just about half a mile from one of our segregation camps with a plague hut in it.

8782. I suppose you found it impossible to make the cordon absolutely efficient?—It was impossible. We had police and chaukidars watching these camps, but it was quite impossible, in practice, to maintain anything like an efficient cordon.

8783. Did Hardwar get re-infected from Kankhal?—Hardwar was re-infected from Jawalapur, not from Kankhal.

8784. When did the outbreak take place in Jawalapur?—The first case in Jawalapur occurred on the 9th January 1898. But in the interval between the last case at Kankhal and the first case in Jawalapur a considerable number of villages in the neighbourhood had been infected, some eight or nine villages from Kankhal direct.

8785. Mr. Winter will give us the details of that?—Yes.

8786. Was Jawalapur infected from Kankhal?—It is impossible to say. At the time that Kankhal became infected, there was something like half a dozen places from which it might have been infected, all in the immediate neighbourhood.

8787. Did you evacuate the town of Jawalapur?—Yes, in exactly the same way.

8788. When was it evacuated?—We commenced to evacuate on January 9th, and we went on continuously. I think they were all out by the beginning of April, but I cannot tell you exactly. There was one muhallah left with about 600 people in it.

8789. Can we get those details from Mr. Winter?—Yes.

8790. When did plague cease in Jawalapur?—The last case occurred in Jawalapur on May 28th. They began to re-occupy the town in the middle of April. I should therefore think probably, with the exception of that one muhallah of 600 people—butchers whom we did not care to deal with if we could avoid it—that the middle of March saw them all out.

8791. As the result of these measures you express your opinion, upon the facts that came out upon the evacuation of those three places, that evacuation is the best remedy. Can you tell us why you hold that opinion?—In the first place, if one is to assume—and it is nothing more than an assumption—that Mahamari and plague are the same thing, evacuation has been done from time immemorial in the Hills, and is almost invariably successful.

8792. We would rather have it on the facts of this particular outbreak?—The principal instructive instance was this. The plague, which was rather bad in October and November in Kankhal, might have been expected to have got worse in January, but as a result of putting the people into camp and evacuating the town it entirely died out.

8793. Why do you say that it might have been expected to have got worse? On account of the climatic conditions, or because the epidemic would become more intense?—From purely climatic reasons.

8794. Have you anything further to say as to the proof of the conclusion that evacuation was effective?—We had quite a small number of cases in our evacuated camps. I have not the complete figures for Kankhal, because they only came by this morning's post; but as regards Jawalapur, we had a little over 717 cases in the observation camps.

8795. Could you give us a statement to show the number of cases which occurred after evacuation in Hardwar, Kankhal, and Jawalapur respectively, with the number of persons who were put into segregation camps?—I am not sure that I can give you the figures with regard to Kankhal or Hardwar.

8796. Were those 717 people taken out of Jawalapur and put into observation camps because they had been in contact with plague cases?—Yes. 21 or 22 plague cases occurred in the contact camps, and four persons were attacked who had been attending plague cases in hospital. Among all the people who went into the camps at Jawalapur—private camps, voluntary camps, and Government camps—and there were certainly 13,000 of them—we had only 69 cases of plague during the whole period of the outbreak.

8797. Your argument is that if they had been left in the town the disease would have become more intense in January, and that there would have been a greater number of cases?—That is my impression. I could give you the statement for Jawalapur, which is as follows:—

JAWALAPUR.

Admissions into segregation (or contacts) camps - -	717
Plague cases in contact camps -	21 or 22
Plague in persons attending cases in hospital - -	4
Cases in the cooly camp - -	15
Total cases of all persons living in camps of any kind -	69

As regards the other places, I may say that I have one set of records, and the Magistrate of the district, the Sanitary Officer, has another, and you had better compare them. I have a general statement as regards Kankhal, and I want to verify it. I cannot tell how many went into the segregation camps, but, as far as I

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can make out, I can only find four instances of plague cases having occurred in the segregation camps or contact camps. I should also mention what is, perhaps, a great source of fallacy with regard to these figures, namely, that very often the attacks in the contact camp take place almost immediately after arrival there, and consequently the infection is quite as likely to have been contracted at the time the plague cases originally occurred in the town. These are the figures with regard to the people in whom the plague did appear.

8798. Supposing you were dealing with a very much larger city than Kankhal or Hardwar or Jawalapur, would you be able to evacuate the people and get them all into camp?—I do not think so.

8799. Would you not require an enormous establishment to supervise them?—In practice you could not do it.

8800. Did the people in Hardwar and neighbouring places show a disinclination to go to hospital?—Very much so, especially at first. At first there was a great deal of prejudice. We got over it to a certain extent by employing native practitioners, but undoubtedly it never died out.

8801. By native practitioners you mean practitioners according to native methods?—Yes, Baids and Hakims.

8802. Did you find the people ready to construct their own camps?—No, not as a rule. They did eventually, but they wanted to do it in their own way, and as a rule it was necessary more or less to assist them, and insist on the huts being built in a systematic and sanitary way, so that the huts should not be so close together that if a fire broke out the whole camp would catch alight.

8803. Would evacuation be possible in these Provinces in the rains?—It would be possible in small towns, but it would be attended with terrible distress to the people.

8804. In the extremely hot weather in the months of May and June would it not be attended with great distress to the people?—It would be attended with a certain amount of distress, but that would be the most favourable time of the year.

8805. You think that it is more favourable than the cold weather?—I think so. In the first place I think the people are more afraid of the cold than they are of the sun, in these Provinces, and pneumonia is more likely to kill people than sunstroke.

8806. Did you find people much afraid of the plague itself?—Oh yes, very much afraid of it. At first interested and ignorant people endeavoured to persuade the populace that plague was really not existent at all in the town, but when once they grasped what the disease was they were very frightened.

8807. Did it lead to any neglect of the ordinary religious rites here as regards dead bodies?—Very little.

8808. I understand that in these three places there was a system of corpse inspection?—Yes.

8809. Did the people like that?—Not at all; but the modifications which we made afterwards induced them to adopt it without any serious opposition.

8810. What were those modifications?—If the case was seen alive within a short period of death, and if the friends could obtain a certificate from a regular medical practitioner, the corpse was exempted from inspection. Otherwise the body was inspected by both the Hospital Assistant and by the practitioner, Baid or Hakim, who was attending the case, and if they both agreed that it was not plague the body was allowed to be taken away. And also, of course, if it was agreed that it was a case of plague.

8811. Do you attach importance to corpse inspection?—I think you cannot do without it.

8812. How does it do any good in the case of pneumonic plague?—You can only go by the history.

8813. What is the value of inspecting the body then?—In such cases it would not be of much value unless you had a *post mortem* examination.

8814. You would not propose to have a *post mortem* examination?—No. I look upon *post mortems* as a very dangerous thing. I would do what we eventually did, and what, perhaps, is the best way out of it, and that is giving the people the option of being treated as infected or permitting an examination.

8815. The special value of corpse inspection is that, provided it is efficient, you get an accurate record of the number of cases?—You get a knowledge of where your cases are occurring. One of the great troubles is to know where a case comes from if the body is examined at a burning ghat or any place like that.

8816. Is the inspection of a corpse made at the place where the man died or where the body is disposed of?—If you examine on the ghat you will, in the majority of cases, be misinformed as to where the man died. You do not know where to disinfect.

8817. Did you find that in some cases the bodies were removed from the houses in which they had been living?—Yes.

8818. You do not necessarily find the infected house by finding a body?—I think the whole system of reporting and observation was so elaborate that it was very seldom done. Now and again a wayfarer, a religious mendicant, would die in a rest-house. In such a case as that the people would put him out on the road or compound. But I do not think they often moved the body from one house to another, although undoubtedly it did occur occasionally.

8819. Were the people subjected in any way to extortion by the native establishments you had to employ?—They were. That is inevitable with a cheap agency. The very people who paid the bribes were the great instigators.

8820. You express the opinion that the great factor in the successful conduct of plague operations in any particular locality will be found in the fact that the Chief Executive Officer is well-known to, and liked by, the people?—I think so.

8821. You would never take the general conduct of those operations out of the hands of the local District Officer?—No, not if he possessed the requisite qualifications. It is an important matter to keep the man at the head of affairs in touch with the leaders of the people as far as possible, and a stranger cannot do that like a man on the spot.

8822. You think that there are different degrees of plague as in other diseases?—Yes. In typical plague, as in typical cholera, there is little room for question as to the character of the disease. It is, I submit, conceivable, however, that in the former disease as in the latter, degrees of virulence of the germs may exist, and that the character of the outbreak may therefore vary. The most important factors determining the degrees of virulence of an outbreak are probably filth, climatic conditions, and reduced constitutional stamina of the individual from famine, want, or allied causes. If this view be correct, herein may lie the explanation of certain differences in the course, fatality, &c., of epidemics of plague in different parts of India.

8823. You have had considerable experience of Mahamari?—I have only seen two outbreaks; but I have had an opportunity of talking to and discussing the matter with a great number of natives who have seen it. It was the experience I had had of Mahamari which enabled me to speak positively as to the character of the disease in the first cases of plague which occurred at Hardwar. There are, I may mention, two forms of contagious, infectious, and very fatal fevers, known in the Himalayas. One is the Mahamari, which I believe to be the same as typical plague as known in the plains, and the other is Sanjar. This Sanjar has all the symptoms of plague with one exception. There are no glandular swellings. It sometimes happens that the first cases in the village are called Sanjar. Presently someone dies with enlarged glands, and the outbreak is called Mahamari, and both are reported to the Deputy Commissioner, and suitable action taken thereon.*

8824. It is the opinion of the Hill people that Sanjar and Mahamari are one and the same thing?—Yes.

8825. Is there any difference in the relative severity of Mahamari and Sanjar?—Yes. Sanjar is not so fatal as Mahamari, and it is rather less contagious and infectious and more likely to die out of itself; but an outbreak may commence with Sanjar and presently pass into Mahamari.

8826. Your opinion is that the two diseases do merge one into the other?—I think so. That is the general opinion up there, and in one particular instance it so happened that Dr. Richardson and myself were inspecting the same outbreak, only as he was concerned with

* A Report on Mahamari in Kumaun, by Surg.-Col. Planck, 1876, is printed as Appendix No. XXV. in this Volume, together with a report by Lt. Walton, I.M.S., and Lt. Douglas, I.M.S., of an inquiry into the disease carried out under the orders of the Commission (Appendix XXV. (1)).

Kumaun and I was concerned with Garhwal, we were really marching parallel with one another, on the border between Garhwal and Kumaun. There was no doubt we were both investigating the same outbreak. But whereas I failed to find any cases with buboes, he, on the other side of the border between the two districts, found a considerable number, and, moreover, ascertained that the people in those villages in which those bubonic cases had appeared, had originally thought the epidemic was one of Sanjar.

8827. Can you tell us something about the symptoms of Mahamari and Sanjar respectively?—The symptoms of Mahamari are those of plague. Those of Sanjar are usually mistaken for those of severe malarial fevers, and it is only when evidence of infectiousness becomes obvious that the people recognise the disease to be Sanjar. No blotches on the skin have been noticed in either disease, and the period of incubation in both is very short. The death of rats prior to an outbreak of Mahamari is so well recognised that people will leave their villages when the rats die in large numbers. It is said they do not die before Sanjar appears, but there may be epidemics in which the outbreak partakes more of the character of one or the other disease; in other words, as I think, is more or less virulent. Speaking from recollection there was no mortality of rats in the epidemic of Sanjar I personally inspected, which was a mild one (mortality 20 per cent.). Mahamari generally breaks out in the cold weather, when the people are huddled together in small rooms with practically no ventilation as doors and windows are religiously closed to keep out the cold. I may mention here that very often for days together the people are snowed up, and sometimes even for weeks at a time, and on such occasions it is almost impossible to conceive anything more filthy than the places where they live, not only the rooms themselves, but also the immediate vicinity of the houses, as they cannot go far for purposes of nature, for fear of tumbling over a khud. The result is the whole place is filthy. The amount of over-crowding must be seen to be believed. At this time of the year the rats would frequent the villages, since the crops are off the ground. If disease existed among rats in the fields they would not bring it to the villages until the autumn. Natives say when Mahamari breaks out, rats are seen to leave the infected villages in gangs. They go into the jungles, as they say, "to find an antidote." They do not go towards other villages. The same opinion holds that the disease rarely breaks out in villages on the sunny side of a hill. If it is so, the village is usually in the shade of a neighbouring high mountain. Damp places in shade are very likely to be attacked. I have been told by many natives that a village once attacked is never safe, unless the houses have been burnt and the site thoroughly cleaned up. Disease may break out again after several years. It is a fact that in past years certain villages were attacked twice after an interval of a few years, while all other adjacent villages escaped altogether, and certain tracts are notoriously more liable to invasion than others. Whereas in ordinary diseases bodies are burnt, in Mahamari this is not so. The body is buried, and, in a rocky soil, very superficially, and the grave is often rifled by jackals and even bears. I have verified this. They also bury Sanjar cases and people who have died of cholera. Snakes are sometimes found dead about a Mahamari village; they are said to eat the diseased rats. Jackals are said to sometimes suffer.

8828. Why do they bury their bodies instead of burning them?—Burial consists practically of little more than abandoning the body. They drag it with a rope and jerk it down a khud and then throw stones on to it from a distance. They are afraid of the contagion.

8829. When they bury it in that way do they succeed in getting it a long distance from their own village?—Not very far. I remember in one outbreak in Kumaun we had to bribe men to lassoo the bodies out of the village; they would not go into the houses to take the bodies out.

8830. Is that due to the fear of infection?—Yes, there is a very vivid fear of infection.

8831. Have you been able to associate this Mahamari with the staple food of the people?—In no way at all. The staple grain in the Hills is "Mandwa" (eleucina). Dr. Watson, who made inquiries into this disease some years ago, thought that the custom of storing grain might lead to the development of a fungus which caused this disease, especially if the grain was buried. But the people rarely bury it, they store it in baskets above ground. Moreover, what seems to me an important point, is that people who leave their villages and go into the jungles almost invariably escape. Yet they take this grain from their houses with them, and live upon it.

8832. What is the belief of the people as regards infection of the soil?—Hill people believe the infection is in the soil, and that it can lie there for many years. They think, also, it can be transmitted by food from infected villages. In one of the epidemics I investigated, the only case which occurred among the people who had vacated the village was that of a boy who went back and stole some coarse sugar from one of the deserted houses. That was a very striking incident, because they had been in camp for some little time, and this was the only case. Infection and contagion are clearly the great propagators of the disease. It is true that when disease appears in a village all communication with it is cut off. But grain is ground at the little water-mills in the streams in the valleys. So villagers conceal the fact of disease being in their villages as long as possible, so as to be permitted to grind their corn with other villagers in these common water-mills. Hill people rarely wash either their persons or their clothes, and hold that dirt is a preventive against Mahamari by closing the pores of the skin. A Hillman's feet are frequently cut by the rocky soil he lives on—inoculation is thereby facilitated. I need not dwell on the sanitary, or rather insanitary, conditions prevailing in Hill villages. They are almost inconceivably bad.

8833. Have you ever heard of an epidemic of pneumonic plague in the Hills?—Never. I never knew there was such a thing until plague occurred in the plains.

8834. What are your views as to the risk of Mahamari being introduced from the Hills to the plains?—I consider the risk of introduction of plague (assuming this and Mahamari to be the same disease) from the Hills to the plains to be slight. In the first place, it is impossible for plague to be concealed in a village for any length of time, as the inhabitants of surrounding villages give early and ready information to the authorities. Then, again, every healthy village is on the look-out for, and prepared to resist, the entry of any person from an infected village. In the Himalayas the population is scanty, and every man is well-known for many miles round. Again, the Hillman is entirely different in appearance and habits from a resident of the plains. The Hillman is timid, suspects dwellers in the plains, and would never flee to the plains to avoid observation. If he leaves his village when disease appears he resorts to the jungles, where he is quite at home, and content in his readily constructed hut. He trades very little, if at all, with the plains, producing very little more than he consumes. There is no wheel traffic in the Hills, roads are bad, and few people can afford horses. Within my own experience there has never been an outbreak of Mahamari occurring in any locality within several days' march from the plains, though Sanjar has been known to occur not far from Naini Tal. The small outbreak in Garhwal, commencing towards the end of 1896, was situated some eight to ten marches from the plains. It commenced subsequent to the appearance of plague in Bombay.

8835. Will you tell us when it commenced?—On the 26th August, 1896, a case occurred in a remote village beyond Okimut. The people went immediately into camp. Something like half-a-dozen other cases occurred, and they were all isolated and the whole thing disappeared in October. Nothing more occurred until the 26th of March, when a telegram reached me on the 1st April.

8836. There was nothing further in the cold weather?—No, Kumaun was absolutely free, and those were the only cases which occurred in Garhwal. Assuming the possibility that an infected person left the infected area and went to the plains (a fact which is absolutely denied), he could not have reached Bombay under 10 days. I think he could have hardly done it under 15. No person is known to have died *en route*, and no intermediate foci of disease were created between the seat of the outbreak and Bombay, either in the Hills or plains. An upcountry Garhwali in Bombay would be a "rara avis" indeed. Pilgrims passing to the shrines of Badri Nath and Kidar Nath pass along the road on the banks of large rivers. Those are sacred Hindu shrines up in the perpetual snows. I have been up to those places. They rarely go near villages. The

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pilgrimage is over by October and does not recommence until May. Such a thing as a pilgrim contracting Mahamari or Sanjar has never been known. When the information of the last outbreak in Garhwal was received, the pilgrim route to Kidar Nath was at once diverted from the vicinity of the infected area. Since the spring of 1897 the points at which the railway touches the hills are watched by special plague inspection officers. To repeat, I consider the risk of importation of Mahamari or Sanjar to the plains from the remote, isolated, and well-nigh inaccessible localities in which these diseases commonly occur very small. But there is a certain risk that these diseases may extend to villages near the plains, where intercourse between plains' and Hill-people is habitual, and, indeed, on one occasion at least this has happened, and disease appeared in the Bijnor and Moradabad districts. That is about 50 years ago, and these districts lie close to the Hills. This danger has not been overlooked by the authorities. I put in a copy of the Mahamari rules,* which have been in force for many years. They are drastic, but efficient, and have never failed. Compensation is given, and the people recognise their necessity. I have carried them out myself without opposition, and in one case, in which I hesitated to burn a somewhat better house, the natives set fire to it themselves in the night. In recent times, although outbreaks have occurred nearly every year, they have never spread, and such deadly and extensive epidemics of the past, as have been described by earlier observers, have never occurred within my own recollection. That is within the last 20 years.

8837. These rules are prescribed by the Government?—They are; they were drawn up originally as the result of the observations and statistics of a special Commission.

8838. Are they enforced by penalties in the event of their not being carried out?—Yes? but they are enforced with some simplicity. The people recognise the the necessity of them. Indeed, I have acted on several occasions without waiting for any particular authority.

8839. I see that they make provision for the evacuation of a village when rats begin to die in any observable numbers; is that an ordinary incident in an outbreak of Mahamari in Kumaun and Garhwal?—Almost invariably. Certainly half a dozen times, when I have been on tour in the Hills, the head-man of the village has reported that rats are dying in his village, and they have taken my advice, and voluntarily evacuated the village for a month and gone into the jungle. I was up there in the hot weather and the rains, so that it was attended with no discomfort.

8840. Have you heard of many instances in which people have left villages on account of the death of rats without plague having appeared?—Yes, certainly, half-a-dozen times.

8841. The rules consist of general sanitary measures for keeping a village clean, evacuation and disinfection when plague occurs, the burning of the house in which the case actually occurred, and the burning of all the effects of the person who died?—Yes, and a thorough disinfection of the rest of the village, compensation being given by the Government to the people.

8842. Has there been any Mahamari in 1897 or 1898?—No, those are the last cases. I have had nothing since then. I think only about 10 days ago a report came in of a suspicious case of Mahamari, about five marches from Ranikhet, and we sent a man out immediately. I got a telegram this morning to the effect that it is not a case. The man was prepared to take specimens; he had been all through the Hardwar epidemic, and he would have done everything had it turned out to be a case of plague. The telegram came in by a runner to the nearest station from the village.

8843. With regard to general sanitary matters, can you tell us whether anything has been recently done in view of the possible approach of plague here to clean up the larger towns in these Provinces?—All the large cities have had special Health Officers appointed since the beginning of 1897, and they have forwarded to me weekly reports. Their work has been not only to look after the general public sanitary arrangements and conservancy staff, and what not, but they have visited nearly every house in the larger cities in these Provinces, accompanied, in every case, by a member of the Municipal Committee, a Hindu or Muhammadan, as the case may be—usually two. They have taken the owner of the house with them and pointed out to him what should be done in the way of improving the latrines, closing dirty wells, and other sanitary measures inside the house. Where the people have been poor the Municipality has assisted them with money to carry out those things. As I say, those reports have come into me every week. Those are the larger towns, I think there are nine of them; and in the smaller towns the same action has been taken by the Civil Surgeons. But in all these larger towns there have been special Health Officers appointed. We could not get all we wanted at first—the plague was at its worst—and we trained half a-dozen Staff Corps Officers, originally in Lucknow, and took them to Hardwar and showed them the system of disinfection for plague and put them on this sanitary work, and they did it very well. We have been remarkably healthy all this year. There is hardly any cholera anywhere in the Provinces. I never remember such a healthy year with regard to epidemic disease generally.

8844. You say that Health Officers have been appointed to these towns; who is the Health Officer under ordinary circumstances?—Under ordinary circumstances the Civil Surgeon is, *ex officio*, Health Officer of the Municipality. In only one place in these Provinces, and that is at Benares, is there a special Health Officer, who acts quite independently of the Civil Surgeon.

8845. Supposing the Health Officer in any one of these Municipalities, say at Benares, or the Civil Surgeon of any of the other Municipalities, is of opinion that a certain sanitary improvement should be carried out, what happens if the Municipal Committee neglects to carry it out?—A copy of his report will be sent to me, and if the matter seemed to be of sufficient importance, I should ask the President of the Municipal Committee what he proposed to do on the subject. He would reply, and if he considered it sufficiently important, he would take the matter up himself. If it struck me that nothing was being done, and the matter was sufficiently important, I should send a communication on to Government for such action as they thought fit to take, with my own remarks.

8846. But supposing the President of the Municipality agreed with the Municipal Commissioners, and went against your opinion and that of the Health Officer, what would be done?—I should then send the case on, I think, to Government. I should probably in such a case as that discuss with the District Officer his reasons for objecting. They would probably be not sanitary but financial, or some other reasons, and as the result of the discussion, I should determine whether to send the matter on to the Commissioner, which would be the first step, or to recognise that, however desirable the matter might be from the sanitary point of view, it was either too expensive or inexpedient for some reason or another.

8847. Is there any means of legally forcing the Municipality to carry out a sanitary improvement which is considered to be necessary by the sanitary authorities and which is not otherwise inexpedient?—All Municipalities have their municipal byelaws.

8848. Supposing a Municipality does not carry out a sanitary improvement which the Health Officer and the Sanitary Commissioner regard as important, and against which there is no other objection, how can you make it do so without getting the Government to intervene?—I know of no other method. My action under those circumstances would be to address the Commissioner and the Municipality through the Collector, and if that failed, there is nothing for it but the intervention of Government that I know of.

8849. Who are the members of the Sanitary Board in these Provinces?—The Secretary to Government in the Public Works Department, the Sanitary Engineer, the Sanitary Commissioner, and the Inspector-General of Civil Hospitals.

8850. There are four of them?—Yes.

8851. Can you tell us what large works have been undertaken in the large towns of these Provinces in the way of drainage and water supply?—I put in a statement.* These and improvements of drainage in rural areas are referred to in my Annual Reports.

8852. Do those big projects go before the Sanitary Board?—They do now, but formerly they did not, unless they were specially referred to the board by the Government.

8853. But they necessarily go to the Board now?—Yes, in fact no scheme involving an expenditure of

* See Appendix No. XXVI. in this Volume.

* See Appendix No. XXVII. in this Volume.

over Rs.1,000 is passed until the Sanitary Board has approved of it.

8854. The Sanitary Board under these present arrangements has a good deal of work to do?—Yes, and it will have a great deal more than it has now, because at the present time there is very little money available after the famine.

8855. What is the system of death registration in the towns of these Provinces?—It varies. Sometimes it is done by the sweepers who report to the Municipal Office, sometimes by the municipal chaukidars, and sometimes by both.

8856. By the sweepers you mean those who are part of the conservancy establishment of the town?—Yes. In some cases they get a definite pay for doing it, and in other cases they are rewarded for each report they make.

8857. Who is responsible for doing it in the villages?—The chaukidars.

8858. Do you think that the measures for reporting deaths in these Provinces are probably as good, if not better, than they are in other parts of India?—I do not think there is any part of India in which registration is as good as it is here, as far as I know.

8859. When these death returns come in from the villages, to whom do they go?—They go first of all to the Police. The chaukidar reports at the Police Station; the Police Officer sends in a return, still in the vernacular, taken from the entries made in the Police Station registers on the chaukidar's report; those are sent to the Civil Surgeon's office; the Civil Surgeon makes abstracts and sends them on to my office; the calculations are drawn up in my office and published in the Gazette and sent on to Government.

8860. Who is responsible for noticing any excessive mortality in any rural area?—I am. I am expected to notice it. My office has standing orders to draw my attention to any return above a certain average which comes in from any Civil Surgeon's office. Primarily the Civil Surgeon should be in a position to recognise that any particular registration area was suffering unduly, or had an unduly high death rate, but the check comes again in my office.

8861. I understand that the Civil Surgeon would be primarily responsible for any action, supposing there was any abnormal mortality in his district?—Yes; as Health Officer of the district it would be his business to communicate at once with the Magistrate, and to say that he suspected something in such and such a registration area.

8862. You would exercise a check over the Civil Surgeon, and if he neglected to observe abnormal mortality, or whether he observed it or not, you would draw his attention to it?—I should ask him whether the unusually high death rate or unusually low birth rate was due to any inaccuracy of reporting which could be ascertained through the Police, or whether it was a real incident, and if so, why, whether there was cholera or something else to explain it.

8863. Do you have a special return of cholera mortality?—Yes.

8864. Have you any reason to suspect that these cholera returns are imperfect?—I think, speaking generally, they are accurate.

8865. For all practical purposes?—Yes. When an epidemic occurs omissions are probably well corrected by over-reporting. That is to say, when an epidemic first breaks out, before it is recognised that the disease is cholera, a certain number of cases escape being reported as cholera; but once cholera is recognised as being present in a village, I think a certain number of cases are reported as cholera, which would not be called cholera at another time, so that for practical purposes I think we know pretty well what is going on with regard to cholera.

8866. The difficulty in diagnosing the disease would prevent your having the same accurate returns for plague, I presume?—In plague we have the great difference that they would object to reporting a case of plague, whereas they do not mind reporting a case of cholera.

8867. Would not there be also the fact that they would not know as much about plague?—Certainly. In the great majority of cases they would not know it was plague; they would omit reporting it from sheer ignorance.

8868. I believe that in the portion of these Provinces that was infected you have devised a special scheme for more accurate registration in order to see if you could detect plague?—We issued a special memorandum.

8869. Did not you employ a special establishment in the rural areas in the neighbourhood of Hardwar in order that you might find out any cases of plague?—Yes, we got something like 400 square miles under a special reporting agency.

8870. What was that agency?—It was originally Hospital Assistants and afterwards Naib Tahsildars accompanied by Hospital Assistants. That agency was quite re-assuring. When disease occurred among certain villages in the neighbourhood of Kankhal we did not know to what extent the whole country might be infected all round, and therefore we took a large area all round the Hardwar Union, and we put it under an organised system of observation as I have described.

8871. Was it an expensive establishment?—I do not think so; there was the travelling allowance plus the pay of the officials.

8872. It enabled you to know whether the plague was extending from those villages?—I think so. It is impossible for anything like an epidemic to occur without our knowing it.

8873. What are your subordinates in the Sanitary Department?—The Sanitary Commissioner is also Superintendent of the vaccinators.

8874. As Sanitary Commissioner what special sanitary establishment have you?—I have nothing immediately under me except two Deputy Sanitary Commissioners.

8875. The Civil Surgeons?—The Civil Surgeons are not under me except indirectly.

8876. Then your special establishment consists of vaccinators and superintendents?—I have no superintendents of vaccination, and consequently all vaccination establishments—between 800 and 900 people—are under me. In virtue of the fact that the Civil Surgeon superintends all vaccination in his own district I hardly ever have any occasion to interfere with anybody under the grade of Assistant Superintendent of Vaccination in a district. Practically vaccination is controlled in the districts by the Civil Surgeons.

8877. The Assistant Superintendent of Vaccination is the head native official of the department in the district?—Yes.

8878. What are the grades under him?—There are three grades of vaccinators, first, second, and third.

8879. Do you employ assistant vaccinators in sanitary work?—We do.

8880. Have you done anything to appoint Assistant Surgeons as Assistant Superintendents of Vaccination?—Nothing, so far.

8881. Have you it in contemplation to do anything in this direction?—Yes; a scheme is now under consideration under which Assistant Superintendents of Vaccination would be Assistant Surgeons with a knowledge of sanitation.

8882. Are you going to employ Hospital Assistants to any extent as vaccinators?—I do not think that is part of the original scheme. It would certainly double or treble the cost of the existing establishment, and I think for that reason it was not done.

8883. If it were feasible financially would it be of advantage to have as vaccinators Hospital Assistants, and Assistant Surgeons as Assistant Superintendents?—I think it would be a great advantage to have the Assistant Superintendent an Assistant Surgeon, but I doubt whether the additional medical knowledge possessed by the Hospital Assistant would make him a very much better vaccinator. If you had Hospital Assistants they would have to be specially trained, and the curriculum of the medical schools would have to be extended.

8884. If you could introduce the Assistant Surgeons into the Department, do you think that they would be of material help to you in detecting outbreaks of plague?—If one had Assistant Surgeons specially qualified, I think so, certainly. The Civil Surgeon has too much work at headquarters to go out and deal with an epidemic, and if the Civil Surgeon cannot go, there is no one else to do it efficiently.

8885. Have you any facts as to the communication of plague by clothing or otherwise? There is a case

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which you have given in your précis?—Yes, the case of Ram Kishan.

8886. I think you mention another case, the case of the Hospital Assistant?—Yes; that was a case where a man, while not suffering from plague, apparently carried the disease to people in his own house.

8887. I understand that this man certainly did not have plague?—He certainly never had plague.

8888. How many of his household had it?—Three.

8889. How far was his house situated from the place where he was employed on plague duty?—From a quarter of a mile to half a mile.

8890. You think that there is no other possible source from which his family became infected?—The only element of possibility about it was the fact that they said that in a house quite close to his own house a man had died under suspicious circumstances about a fortnight before, but I made full inquiries into the matter at the time, and came to the conclusion that that was certainly not a case of plague. This Hospital Assistant attended the first case in Kankhal on the 16th September; he attended another case in the same house on the 19th September, and on the 23rd September a member of his own family was attacked, and two in the same house followed in a day or two. I cannot think of anything more convincing than that.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Metcalfe Hall, Agra.

TWENTY-SIXTH DAY.

12 Jan. 1899.

Thursday, 12th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Dr. A. E. WRIGHT, M.D.
Mr. A. CUMINE.
Dr. M. A. RUFFER, M.D.

Mr C. J. HALLIFAX (*Secretary*).

Lieut.-Col. THOMSON, I.M.S. recalled and further examined.

8891. (*The President.*) We wish to get a little more information from you?—Certainly.

8892. (*Dr. Ruffer.*) Yesterday you stated your opinion that in all probability Sanjar and Mahamari were two different forms of the same disease; that both Sanjar and Mahamari were plague?—Yes, that is the impression.

8893. I do not gather why you believe Sanjar to be a form of plague. As far as I can make out, your only reason is that Sanjar and Mahamari occur in the same districts at the same time?—In the same epidemics.

8894. I want to know this: is there a transition stage between Sanjar and Mahamari?—What induced me to form the opinion that they were the same disease was in the particular epidemic in which Dr. Richardson and myself investigated the matter, and we thought it was clearly the same epidemic. We happened to be both making investigations at the same time. He was in charge of one district, and I was in charge of the neighbouring district, and the epidemic spread over both. He had noticed that in some of the cases he saw buboes were present, and they were typical cases of Mahamari. In the case which I observed I found no buboes. He also noticed that whereas evidently the type of the disease was distinctly like Mahamari, at first the people in the villages had not suspected it was anything more than Sanjar; and it was only when they began to notice buboes that they came to the conclusion it was Mahamari. What I mean to say is that here was an epidemic in which a considerable number of people had no buboes at all, while in a certain number of cases buboes had appeared.

8895. You are aware that in certain places, in gaols for instance, epidemics of typhus and relapsing fever may occur at the same time; why should not Sanjar and Mahamari occur at one and the same time, and yet be different diseases?—It is quite conceivable, but at the same time both Sanjar and Mahamari are not ordinary diseases, and the epidemic both of Sanjar and of Mahamari commenced and terminated about the same time. It was rather an unusual coincidence that these both rather rare cases happened to be running at the same period.

8896. You said that the villagers believe that the rats during an epidemic of Sanjar do not die?—I think, as a rule, the symptoms of Sanjar are of a milder type than the others. In this particular case I speak of I do not think the rats did die. I think it is quite conceivable that later on, if Sanjar passed into Mahamari, rats would die.

8897. You say in your précis of evidence, "It is said "they do not die before Sanjar appears"?—Yes.

8898. And a little lower down, "Speaking from "recollection, there was no mortality of rats in the "epidemics of Sanjar," whereas I understand in epidemics of Mahamari the rats always do die, and the villagers know an epidemic is going to break out because of this mortality among rats?—That is so.

8899. Are not the two diseases, then, quite different as far as rats are concerned?—I say I can conceive that the virus in Sanjar is so mild that the rats would not die: that when it became sufficiently intense to produce Mahamari, the rats would be infected.

8900. What is the mortality in Sanjar?—In this particular epidemic I am referring to, the mortality was about 20 per cent., whereas it would be very much higher than that in typical Mahamari.

8901. Mild cases of plague are generally bubonic forms of plague; but I understand that in Sanjar—which you take to be a mild form of plague—the buboes are absent?—Buboes are absent.

8902. Sanjar would, therefore, be a mild form of plague, differing entirely from the ordinary mild form of plague?—I should take it that Sanjar is even milder than a mild form of plague, or a mild form of Mahamari.

8903. Still there is a mortality of 20 per cent.?—Yes. I cannot give you the exact figures, but I should say the mortality in typical Mahamari is about 75 per cent.

8904. Have you any bacteriological investigations as to Sanjar that you could put in?—Up to the present we have had none. Arrangements are now being made for investigation to take place should cases of Mahamari and Sanjar occur.

8905. You lay great stress on rats being to some extent the propagators of plague; how do you think one rat catches the disease from another?—I do not know how it would contract the disease from another rat any more than I am sure how one man gets it from another.

8906. In a plague epidemic among rats, do you think the rats catch the disease from one another, or do you think the epidemic points to there having been several cases of undetected plague among human beings in the locality?—I think the mortality among rats invariably precedes that among men.

8907. But I recollect we have been told of several villages in which there has been no disease among rats, and a very high mortality from plague among human beings?—I can conceive the incidence of plague among rats being secondary to that among men, but I have never come across a case in the Hills.

8908. We have had it in evidence that the virus of plague in passing through rats becomes attenuated; if the virus really thus becomes attenuated, how can the disease spread from rat to rat? I believe you said yesterday in your evidence that at Hardwar you thought there might have been cases before the first case was detected?—I said that we had very conclusive evidence of the existence of cases.

8909. In Hardwar itself, the first case was that of an old woman who had suppurating buboes; was that not the first detected case?—Yes.

8910. I think you said yesterday that there might have been cases before the detection of that old woman?—That is perfectly correct; but there were no rats infected at all.

8911. Was there not another village in which you are of opinion that there had been some cases of plague before the first was detected?—The opinion I have formed from the inquiry was that it was a case of the direct introducing of disease from an infected area by a man from Karachi. I believe it was due to the fact of a man suffering from plague, or if not suffering himself, carrying virus in his clothes, arriving in Hardwar, living in a house, and infecting the inhabitants.

8912. But you think there may have been several cases undetected before this case?—Unquestionably. We found cases in which the condition of the people showed that they had been suffering for some little time.

8913. Then as there had been undetected cases of plague, might there not have been several foci from which rats might have become infected?—As a matter of fact, the rats were not infected at all in Hardwar, so far as we could find out. With regard to the Kankhal outbreak, the conditions are quite different. The epidemic among rats bridged over the interval between the disappearance of plague in Hardwar and the commencement of plague among men in Kankhal.

8914. Quite so, but if several undetected cases of plague occurred in Hardwar, may there not have been undetected cases of plague at Kankhal from which rats may have been infected?—We had the town under very close observation. We were constantly on the look out for the possibility of such an incident. There were two cases. One was that of a beggar woman, who died in a garden on the outskirts of the town. There was not the slightest reason to suppose that she had had any communication with the town itself. It was spoken of as a case occurring in Kankhal, but it was really quite away from the town. As far as we could ascertain I do not think there were any concealed cases, or any cases which occurred without our knowledge. The second case was that of Ram Kishan, the priest. In that case there is a possibility that rats might have been infected.

8915. Then there are two foci at least from which rats might have been infected?—The first case of the beggar woman is very improbable. It is extremely improbable that Kankhal was infected from her.

8916. On the 16th September 1897 you found one case; you say that other cases followed in the neighbourhood. Could you tell me how many cases there were before the town was evacuated?—The town was evacuated gradually.

8917. How many cases of plague were there in the town before the town was totally evacuated?—I cannot give you the exact figures; I should say something like 30 or 40 cases.

8918. As regards Kankhal, how many cases were there after the town was evacuated into camps?—I cannot give you the number exactly; I have not got the Kankhal figures of the cases occurring in the camps.

8919. Speaking from recollection, do you think there were 30 or 40?—Speaking from recollection, I should not think there were as many as that.

8920. But the epidemic did not stop until the 26th of December?—That is the date.

8921. Did you find that the cordons you put round the town were efficient?—No, they were not.

8922. In what way were they not efficient?—In the first place, the area to be guarded was far too large; in the second place, it is very easy to slip past men in the dark; and in the third place, the individuals put on to form the cordon were always open to bribes.

8923. Did you have medical supervision in the camps themselves?—Yes.

8924. Did you have a roll call every day; or how did you ascertain that the number of people in the camps remained the same?—There was a roll call morning and evening, I believe.

8925. In every camp?—Yes, in every camp.

8926. How many European medical officers did you have on duty in these different villages, at Kankhal, Hardwar and Jawalapur?—The number varied; but there were generally four or five on an average.

8927. What is the total number of medical officers under your supervision in the North Western Provinces?—I have only two Deputy Sanitary Commissioners.

8928. What is the total number of Civil Surgeons?—There are 48 districts, each having a Civil Surgeon, and there are two Deputy Sanitary Commissioners, and during the period of plague there were a number of officers specially appointed. The complete details of the medical staff of the Provinces is as follows:—

Commissioned Medical Officers.

Inspector General of Civil Hospitals	1
,, ,, Prisons	1
Sanitary Commissioner	1
Deputy Sanitary Commissioners	2
Civil Surgeons	34
Medical officers in military employ holding collateral Civil charges	4

Uncovenanted Medical Officers and Military Assistant Surgeons in medical charge of districts.

Uncovenanted European Medical Officers	2
Military Assistant Surgeons (Europeans and Eurasians) in Civil charge	11
Military Assistant Surgeons (Europeans and Eurasians) in subordinate charge	5

Civil Assistant Surgeons.

Civil Assistant Surgeons (Eurasians and natives of India) 71 + 10 for Reserve	81
Health officer of Benares	1

The Sanitary Commissioner, the two Deputy Sanitary Commissioners and the Health Officer of Benares discharge purely sanitary duties. The other officers discharge such duties in addition to their medical work, so far as their time allows. Sanction to the appointment of 10 Assistant Surgeons as Sanitary Assistants to Civil Surgeons of districts has been granted by Government under G. O., No. 386, of 2nd December 1896, and these officers will be appointed as soon as they are available, and funds provided in District Boards budgets.

8929. You say in your précis of evidence that you had a great many cases of plague among people engaged in disinfection work; could you tell us the number of cases you had?—There were 29 disinfection coolies attacked, but of these three must be deducted, as they were not working as disinfecting coolies.

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There remain 26, regarding whom I give the following particulars :—

Cervical glands enlarged	2
Inguinal	9
Femoral	8
Axillary	1
Femoral and inguinal	2
No glands enlarged	4
	26

8930. Were the coolies kept away from the other people living in the camps?—They were. Nearly all of them were living in a separate camp. A few of them lived elsewhere. The water-carriers and sweepers and people of a different caste had a special camp of their own.

8931. Did they communicate at all with the other people in the other camps?—Only, as I say, in the case of water-carriers and other men who for caste reasons did not care to live in the coolie camp. It was not always possible to be sure that the whole of the disinfection coolies were living in the camp; their duties took them all over the town, and at different periods.

8932. I suppose you could give us the number of cases of plague which occurred in Jawalapur before evacuation and after evacuation. Shall we be able to get that in evidence?—It may be that Mr. Winter can give you the figures; but it is exceedingly difficult to say exactly how many cases occurred before and after evacuation in both Jawalapur and Kankhal, because the evacuation was not carried out *en masse*. Block by block was evacuated as block after block became infected.

8933. But in both cases the whole town was evacuated?—It was; but it was quite late in the epidemic. Indeed, with regard to Jawalapur there was a small area which was never entirely evacuated. A small area containing about 600 people was never evacuated. Although, of course, it was thoroughly disinfected, and so on, the people were never moved into camp.

8934. How was the disinfection effected in the town? —Sulphur was burned in the rooms, and the floors were dug up. If they were kutcha, the walls, ceilings, and floors were all saturated with the perchloride of mercury solution—1 in 1,000 of perchloride of mercury, and two parts of hydrochloric acid.

8935. That is Mr. Hankin's formula?—Yes; it has been used very commonly. Subsequently most of the houses were lime-washed after they had been left empty for some time. All chappars, grass huts, grass roofs, and grass verandahs were burnt, and 4 inches of earth were taken from the floors. We disinfected the floors first because we feared the coolies getting inoculated, or in any way contracting the disease from the infected floors. They would not wear shoes.

8936. Did you make a bacteriological diagnosis in any case of plague?—Samples were sent to Mr. Hankin for examination.

8937. Cover glass preparations were sent?—Mostly cover glass preparations.

8938. What provision have you got for bacteriological investigations in the Provinces?—There is a bacteriological laboratory at Agra—the one under Mr. Hankin. All the bacteriological investigations are carried out there. There is also a bacteriological laboratory at Maktesar in Kumaun, which is under the Government of India. Up to the present time that is being used for bacteriological investigations with reference to cattle disease.

8939. Professor Lingard's laboratory?—Yes. The Government of India agreed last year, in the event of an outbreak of Mahamari occurring in the Hills, that samples might be sent there and investigated by Mr. Lingard.

8940. Is that all there is in the Province?—That is all. That is a public laboratory.

8941. Could you tell me roughly the total population in the Province?—Forty-six millions.

8942. (*Professor Wright.*) Would you tell me the meaning of the native words "Mahamari," "Sanjar," "Gola rog," and the rest of them?—"Mahamari" means "the great disease."

8943. What does "Sanjar" mean?—"Sanjar" is derived from a Sanskrit word, meaning "infectious" or "contagious."

8944. What is "Gola rog"?—"Gola rog" means disease with a lump.

8945. You say in your précis that you connect these diseases because the epidemic of the two occurred in association?—Yes.

8946. Further, you say that Sanjar has all the symptoms of plague, except the buboes?—Yes, in a milder form; that is to say, the temperature will not rise so high.

8947. Have you seen any of these cases from start to finish? Do they run a short or a long course?—I have never watched any individual case from start to finish, but I have seen cases in all the stages.

8948. Do you know how long an attack of Sanjar lasts? Is it a chronic complaint, or does it run its course in a few days?—As a rule, if a man is going to die of Sanjar, he will be ill for a week or 10 days. Several fatal cases have simply died from exhaustion following continued high fever.

8949. Do you mean that when a man dies of Sanjar, it will always be in the first 10 days?—If a man dies later than that, he will probably die from exhaustion as the result of continued high fever.

8950. The fever may go on for longer than 10 days, may it?—I do not think I have ever seen a case in which the fever lasted longer than 10 days. But I speak very guardedly about that, because it is very difficult to get at these cases and to watch them. It is not like treating a case in a hospital. You must catch them when you can; and you probably have not very much time to devote to any one individual case.

8951. Has the disease been studied by anybody who has stayed on the spot in a particular infected village for a period of days?—I do not think it has been studied by anybody who has been in a village for more than three or four days at a time. It may be so, but it is not within my knowledge. There was one important Commission which inquired into this matter some 30 or 40 years ago, and it is very likely they did stop in the villages for longer periods, but I have no evidence about that; it was before my time. I never have stopped in the villages for that length of time, nor do I think anyone has during the period I have been in India. But I was by no means the first to inquire into the matter. I have no doubt very much more extended observation was made earlier by Dr. Pierson, Dr. Planck, Dr. Rennie, and others.

8952. In both Sanjar and plague there is acute fever? —Yes.

8953. What other common points have the two diseases?—High fever—the intensity of the fever—the early delirium, the great infectiousness and contagiousness; those are the principal points. In an epidemic of Sanjar, as I have said, the earlier cases are probably regarded as severe malarial fever until it becomes quite obvious that the disease is distinctly infectious and contagious. It is then probably called Sanjar. But if, after a short time, a man dies (there may be half-a-dozen cases before a man dies with bubonic enlargements) it is then recognised to be Mahamari.

8954. How wide is the tract of country over which these two diseases occur; is it many hundred miles across? How large is the area liable to be attacked?— It would take from 20 days to a month to get from one end of the tract to the other.

8955. You say you have never seen an epidemic of pneumonic plague in a village, but have you ever seen individual cases of pneumonic plague in these people? —I did not know that there was such a thing as pneumonic plague until I saw the plague at Hardwar. I have never heard of a suspicion of that kind of plague in the Hills.

8956. (*The President.*) I do not quite understand what this Sanjar is. You say in your précis that you and Dr. Richardson called it a malignant typhus fever which might pass into typical Mahamari; what do you mean by typhus fever?—We used a term there at a time when we were not really acquainted with plague.

8957. Were there any of the symptoms of typhus fever associated with this disease? Was there any skin eruption in Sanjar like the characteristic skin

eruption of typhus?—I have said there were no blotches or any form of skin eruption. It is conceivable that there might have been mild forms which one could not see in a black skin, especially in an exceedingly dirty one; but I have never noticed anything of the kind.

8958. It is not known that it is accompanied with an eruption?—It is not known to be accompanied with an eruption.

8959. The word typhus, therefore, is not used in its strict acceptation?—The word is used rather loosely by Dr. Richardson and by another doctor; it is spoken of as typhus, being more or less allied to Levantine plague. They speak of it as malignant plague. We had never seen plague at that time, although this was called Hill plague. We knew nothing about plague as it is now understood in India. We called it something worse than typhus.

8960. I understand that there might be cases of this Sanjar which are typical cases of plague, the severe form which represents all the aspects of an unmistakable case of plague?—With the exception of buboes.

8961. The bubo does not occur at all?—It does not occur at all in Sanjar, but as far as my experience goes, the only real distinction between an imported case of Mahamari and a bad case of Sanjar would be the existence of buboes in Mahamari.

8962. These patients are not really ill when they suffer from Sanjar, are they; are they laid up?—Oh, yes; it is a very serious disease; it is considered to be very dangerous. It is the subject of a special report to the authorities, and of special action, even if it never passes into Mahamari. In the particular epidemic I am referring to, as I have said, the mortality was about 20 per cent.

8963. Do the patients ever walk about when they are suffering from this disease; might the affection be so mild that they can go about and follow, to some extent, their occupations?—It is conceivable, but not likely. In all the cases that I have seen, the individual has had such a high temperature that he could not do anything.

8964. Could that occur in Mahamari? In mild cases of that disease, could people go about and follow their ordinary occupations?—No, I do not think so.

8965. But the mild cases are not probably brought under your notice if they do occur?—The mild cases of Sanjar might not come under one's observation, but Mahamari is so dreaded and used to be so fatal in the Hills, that, although it is possible the inhabitants of a village, in which cases are occurring, might not report it, the neighbours would report it very quickly. They voluntarily cut off all communication with the village.

8966. The association or identity with plague appears to be that you may have in the first instance some cases of this disease, and a little later on the cases may assume the form of plague in other individuals?—It may originate as an epidemic of what is understood to be Sanjar, and directly cases occur in which buboes are discovered, the whole epidemic is regarded as one of Mahamari; but the fact of two such unusual diseases occurring in the same locality at the same time made both Dr. Richardson and myself come to the conclusion that they must be modifications of the same disease. These observations were made under considerable difficulties. These are very inaccessible places. The people are very dirty, the huts are very dark, and in a time of considerable panic in a locality it is difficult to keep the people under observation. These, however, are the impressions conveyed to me from what I have seen. They have no scientific accuracy; they represent not only what I have seen but also the result of a great deal of conversation and discussion with natives in the Hills.

8967. Is it a frequent occurrence that an epidemic of Mahamari is preceded by cases of Sanjar?—No, it is not an infrequent occurrence, when one speaks of incidents which are both infrequent. It is not an infrequent occurrence for the epidemic never to pass beyond the stage of Sanjar; for a village to be attacked with what they call Sanjar. Perhaps there may be half a dozen or ten cases without any of those cases developing buboes. The matter there ends.

8968. That is because the disease had been stamped out?—I think the virus has never obtained a sufficient amount of virulence to produce the characteristic symptoms of Mahamari.

8969. I should like to ask you a few questions with regard to the sanitary arrangements. You have given us a great deal of information already, but can you tell me when this present staff of officers was first appointed—about what time was the present permanent staff of men who do sanitary work appointed—the Sanitary Commissioner and his deputies?—I cannot give you the exact date, but it was a long while before I came to India.

8970. You speak also of district medical officers?—The Civil Surgeon of a district is *ex officio* the Health Officer of his district.

8971. Those are the district medical officers you referred to? You have told us, however, that their time is otherwise fully occupied?—A scheme has now been sanctioned whereby as opportunity occurs, as men are available, each Civil Surgeon is to have a Sanitary Assistant who will be an Assistant Surgeon. In the larger districts the Civil Surgeon is very busy, but he has at his disposal a certain number of Assistant Surgeons connected with the hospitals, whom he can depute to make any particular inquiry. That applies also to the smaller districts, but there the Civil Surgeon has more time, and can usually make such inquiries himself. Where the matter is of some importance, an investigation would probably be made in the case of an outbreak of cholera, or anything of that kind, by the Deputy Sanitary Commissioner or the Sanitary Commissioner himself.

8972. I do not refer to emergencies, I rather wish to speak of ordinary normal conditions—conditions in the absence of any special call upon the sanitary staff. At those times the work is chiefly done by the Civil Surgeon, and in some cases, where recent appointments have been made, by his assistants?—That is so

8973. How many such assistants are there now in your North-West Provinces and Oudh?—Six or seven special Health Officers are appointed to the larger towns in these Provinces, who are occupied principally in looking after the sanitation of the towns during this period of plague. They also would be available.

8974. I suppose the six or seven are liable to go to other duties when plague disappears; what are the permanent conditions now?—At present we have a Health Officer in Benares and a Civil Surgeon, but up to the present time, in consequence of the pressure, there are no special Sanitary Assistants appointed to the Civil Surgeons.

8975. There are at present none of these district assistants to the Civil Surgeon excepting for plague duty?—That is all at present.

8976. They are temporary appointments?—Yes, I cannot say what would be done, but orders for their permanent employment are actually in existence. If these men were available they might be retained as Sanitary Assistants to Civil Surgeons, but the fact that they have not been appointed so far in these districts is due to the fact that we require them more particularly for plague work.

8977. Before the plague they did not exist?—No.

8978. The result, however, of having these additional six or seven has been that the health and mortality has been very satisfactorily affected?—I never remember such a healthy year before. We have been practically entirely free from cholera or any epidemic disease. These special sanitary measures were begun in 1897 and have been carried on. There was a slight cessation for a couple of months or so in the last year, when plague died down, and when the men were taken off, but they are all at work again now. With that interval of two months, however, from the beginning of 1897 we have had a special staff employed in all the big towns in the Provinces; we have had a special Health Officer engaged in this particular work.

8979. These six or seven are not restricted to towns; do they do work in rural districts?—They are appointed for large centres of population. In the smaller towns the work has been done by the Civil Surgeon in addition to his other work; he has much more time at his disposal.

8980. (*Mr. Hewett.*) The Civil Surgeon has for his ordinary duties an Assistant Surgeon to assist him?—Yes.

8981. Is pneumonia very prevalent in the Hills?—I do not think so.

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8982. Will you arrange to send us copies of any reports that are received with regard to the bacteriological examination of any Sanjar cases or Mahamari cases?—Yes. The orders are existing now to that effect. I will have copies sent to you whenever cases occur.

8983. You spoke of 29 members of the disinfecting gang being infected. That is only in Jawalapur, is it not?—That is only in Jawalapur.

8984. (*Dr. Ruffer.*) You spoke of a medical officer being appointed for Benares. Is he a European medical officer?—No, but he is an Assistant Surgeon who has taken the D.P.H. Cambridge examination, and has been educated in England.

8985. What is the population of Benares?—It is a very large town. According to the last census the population was 211,586; it is larger, of course, now.

8986. With regard to the Assistant Surgeons who have just been appointed, have they had any special training in hygiene?—They all go through a course of hygiene before they qualify; they have no special qualifications.

8987. I think the bacteriologist of the North-West Provinces has some other duty besides being bacteriologist?—He is also a chemical examiner.

8988. He has to make a great many reports, I believe?—I think so, but I know very little about the amount of work that goes through his office.

8989. (*The President.*) With regard to the supervising Sanitary Board you told us of yesterday, how often does it meet?—On an average three or four times a year. There is a resolution bearing upon that point. As I told you yesterday, it consists of the Inspector-General of Civil Hospitals, one of the two Secretaries in the Department of Public Works, the Sanitary Commissioner, and the Sanitary Engineer. When it meets in a district, the Commissioner of the division, the District Magistrate, the Civil Surgeon, the District Engineer, and the delegate from the District Board, are all *ex officio* members. Any projects involving the expenditure of over Rs. 1,000, which may have been before contemplated by any District Board in that division is brought up for the opinion of the Sanitary Board before official sanction is accorded.

8990. If a local Sanitary Authority did not take action under any report which was laid before them by the proper sanitary experts, what, then, is your action?—If I considered that in any particular town there was a sanitary shortcoming of sufficient importance, my action would be to send in a report to the President of the Municipal Committee, who would consider it. I should at the same time discuss the matter with the Civil Surgeon and the District Officer, and ascertain whether the finances of the Municipality permitted of the measures being taken which I thought were desirable, or whether there was any special reason why that particular action should not be taken. If I failed, I should address the Commissioner of the Division on the subject and ask him to use his influence with the Board. If that failed I think there would be nothing to do but to address the Government on the subject.

8991. How often has a local authority failed to take action within your term of office?—I cannot call to mind any cases in which they have positively declined to carry out any of my suggestions; but they have very often said that they will do so as soon as funds admit, or as soon as they can afford it. As a matter of fact, most of the things were eventually done, but they took a long time to do them.

8192. You, therefore, have not had any occasion to make those appeals you have referred to?—As far as I can recollect, I have never had to write to the Government to say that it was hopeless writing any more, although at the same time it is often the case that it is only after very considerable difficulty that one can get these things carried out.

8993. With regard to what you said about communication from rats, I suppose your view is that plague may be communicated from men to rats?—I think it may be.

8994. And your view is, likewise, that it may be equally communicated by rats to men?—Certainly.

8995. (*Mr. Cumine.*) Has it been noticed that Sanjar generally occurs in April and May, when plague is declining on the western side of India, and Mahamari generally in the cold weather when plague is rising over there?—Sanjar and Mahamari may be expected to occur about the same time. Most cases are likely to occur in the cold weather.

8996. Just as Sanjar sometimes precedes Mahamari, so does Mahamari sometimes decline at the end of the epidemic into Sanjar again?—I have not made myself perfectly clear about that. In some cases one hears nothing about Sanjar.

8997. But when it does apparently originate as Sanjar, and becomes virulent enough to be called Mahamari, does it at the end sometimes decline again into Sanjar?—I think not. The effect of isolating the people, and taking them into the jungles, and evacuating the villages causes the disease to die out as a whole.

(Witness withdrew.)

Mr. E. F. L. Winter, I.C.S.

Mr. E. F. L. WINTER, I.C.S., called and examined.

8998. (*The President.*) I believe you are one of the Secretaries of the Government of this Province?—I am.

8999. And how long were you in charge of the Saharunpur district?—I was in charge of the Saharunpur district from the 20th of April 1897 to October 1898.

9000. In what parts of the district did plague occur?—Plague occurred only in the Hardwar Union which comprises the three towns, Hardwar, Khankal and Jawalapur, and in a few villages in the immediate neighbourhood. The village furthest from Hardwar in which an indigenous case occurred was Ranimazra about eight miles away. There was one case which was exported from Jawalapur—at least the man died four days after leaving Jawalapur at a village called Bundajuda, which is 30 miles from Jawalapur. There was no plague anywhere else except one isolated case in Saharunpur town.

9001. Would you give us a description of the inhabitants of these places?—The inhabitants of Hardwar are almost entirely Hindus. They are mostly concerned with making arrangements for the pilgrims who frequent the place, priests, a number of Banniahs and others who supply them with food, and shopkeepers who supply them with the various articles they buy at a fair. At Kankhal you have the heads of a number of religious communities and people connected with them, a certain number of well-to-do persons who live there, and about one-fourth of the total number of Pandas living in the Union; there are shopkeepers and the usual low caste people. There are very few Muhammadans there.

9002. These are the permament inhabitants? I believe there is also a large floating population?—Yes, there is the floating population at Hardwar—pilgrims who come there on the occasion of fairs or to bathe on propitious days, and a certain number of people—Sadhus, beggars and others who are attracted to a religious place. A certain number of old people generally come to die on the banks of the Ganges.

9003. What is the population of Hardwar?—It is very difficult to say. Even what I may call the resident population varies extremely from month to month. The shopkeepers, for instance, are not permanent residents of Hardwar. A large proportion of them come from such places as Umballa and Benares; they come for a few months during the time when the pilgrims mostly frequent the place, and the number coming varies with the number of pilgrims expected. At the last census, if I remember rightly, the population was between 4,000 and 5,000. That census was taken in January, shortly before a large fair took place, and arrangements were being made for it.

9004. The number who come for these religious purposes is very much larger?—You may get 2 lakhs, 5 lakhs, and occasionally 10 lakhs in Hardwar at the same time.

9005. What kind of houses are there at Hardwar?—The houses are extremely well built at Hardwar. There

are a very few mud huts and a very few grass huts. The buildings are mostly built of stone or brick.

9006. Are the houses well ventilated?—Very fairly; better than in most towns. The town is a small one. It is open and has been constantly inspected for many years past. A large proportion of the houses consists of lodging houses which are specially licensed. Before they are licensed they are inspected, and any deficiencies in the matter of ventilation and so forth have to be set right.

9007. Is overcrowding provided for?—A small piece of tin is stuck up over the door of every room to show the number of occupants that the room will hold. This number is fixed according to the cubical contents of the room. If at any time of inspection the number of occupants exceeds the number allowed the owner of the lodging-house is prosecuted.

9008. How are these satisfactory requirements maintained—what staff is there to look after the place?—There is the Municipal Board at the head of which is the Chairman. The Chairman is the Collector of the district, and the Vice-chairman is the Joint Magistrate in charge of the Rurki sub-division of the District. The town is in the special charge of this Joint Magistrate and under him he has the usual native establishment.

9009. Where does the Magistrate live?—At Rurki.

9010. How far is that?—Rurki is about 19 miles away. There is train from Rurki to Hardwar.

9011. It is within easy reach?—Yes, it is within easy reach.

9012. How is the medical profession represented?—The Civil Surgeon of the Saharunpur district is ordinarily in charge of Hardwar, but on the occasion of large fairs two or three Sanitary Officers are deputed. The Sanitary Commissioner and a Deputy Sanitary Commissioner are always there, and the Civil Surgeon would be there as well. Locally there are three Hospital Assistants always on duty in the Union.

9013. What is the state of Khankal?—Khankal also contains a very large proportion of well-built houses. The huts are separated from the rest of the town. They are on one edge of it. Though small in number the houses are extremely large, with a very small number of people living in them as a rule, because they are made to accommodate those religious communities who visit Khankal on the occasion of the large Kumbh fair, which occurs at intervals of 12 years.

9014. During the time of these fairs, you took measures to prevent the overcrowding of houses did you not?—They are all inspected.

9015. The number occupying the houses is limited?—Yes, there is a limit for each room of a lodging-house or rest-house, and no pilgrim is allowed to put up in any house but a licensed lodging-house or dharamsala—a free resting house. The lodging-houses pay licence fees, and the dharamsalas do not.

9016. What is the number of the resident population of Khankal?—About 5,000.

9017. Where do the others live?—There is a large island opposite Hardwar which at the time of the big fairs is connected with it by two, three, four or more temporary bridges. On this island, sites are marked out and the pilgrims go there and set up their little tents or hang blankets from poles.

9018. Will you tell us what is the condition of Jawalapur?—Jawalapur is more like an ordinary Indian town; Jawalapur is the business quarter of the Union. There reside the Muhammadan zamindars of the land in the neighbourhood, and three-fourths of the Pandas and bankers and merchants. It is far more densely populated than either Khankal or Hardwar, and half the town consists of mud or thatch huts. There are no lodging houses and no dharamsalas.

9019. When first did you anticipate the possibility of plague entering this district?—Plague entered it before I joined the district. I have all the records of it, and can describe what happened.

9020. You say in your précis of evidence that "with "plague in Bombay and Sind special precautions were "adopted to prevent its being imported by pilgrims into "Hardwar": what were the precautions?—I was speaking of the precautions taken elsewhere than at Hardwar; that is to say of the inspections at the large railway stations on the frontier.

9021. In order to prevent the entrance of plague into Hardwar?—Yes, at Saharanpur there was one of these general inspections that would prevent the importation of plague into Hardwar, because nearly all the pilgrims going by rail would travel *viâ* Saharunpur; that is the junction they would have to change at.

9022. What was done with the pilgrims or other passengers?—They were taken out of the train, put in line and examined by the Assistant Surgeon or whoever may be on duty at the time. Special arrangements were made for the examination of females. At one time there was a separate enclosure to which they were taken and examined by a female Inspector.

9023. What were the special precautions taken at Hardwar?—In April there were two fairs—the Amawas on the 2nd of April and the Dakhauti on the 11th. The attendance at the Dakhauti was expected to be unusually large, as it was also an Adha Kumbh. Accordingly in March special arrangements were made at Pathri, a small station between Lhaksar and Jawalapur, for a minute and careful examination of all pilgrims. On their arrival at that place all passengers were required to alight and were carefully inspected by a special medical staff, selected for the purpose. All passengers from infected localties in Bombay and Sind were placed in special carriages in the rear of the train, the carriages were locked, and on arrival at Hardwar these pilgrims were escorted to a special camp erected for their accommodation on an island in the river connected by a bridge with Hardwar. Here they were registered and kept under observation. They were required to sleep and feed in this camp, but were allowed to visit Hardwar during the day. Over 600 persons were accommodated in this observation camp during this fair. No case of disease occurred among these people.

9024. Were the lodging-houses inspected?—The lodging-houses were constantly inspected, and the streets and bazars were patrolled by the subordinate medical staff, who maintained a careful watch for suspicious cases of sickness, and, when three suspected cases were discovered on the 8th and 9th of April, arrangements were also made to inspect and watch all pilgrims leaving Hardwar, whether by road or rail. None of the departing pilgrims were found to be suffering from plague. Hospitals and segregation huts were erected at Pathri and at Hardwar. Special measures were also adopted to perfect the conservancy arrangements and to keep the town and neighbourhood as clean as possible. The ordinary conservancy staff was increased by 34 sanitary police, 36 vaccinators, 500 sweepers, and 130 chaukidars. These measures were also extended to Kankhal and Jawalapur, which, from their close association with Hardwar, required careful watching.

9025. When did you have the first case of plague?—The first suspicious case at Hardwar was reported on the evening of the 8th of April. A resident of Hardwar, the wife of a Nai, died after four days of high fever, and on examination showed an enlarged gland in the groin. On bacteriological examination being made, the gland was found to be swarming with bacilli, exactly like those of bubonic plague. The woman had died in a hut near the main road of Hardwar. The hut in which she died and those adjoining were burnt, and her husband, the only other person living in the hut occupied by the deceased, was segregated. The couple had, till within two days of the woman falling ill, been living in the house of a Brahman woman, the owner of a lodging-house and the sister of a Panda, whose clients were Sindis and frequented her lodging-house. On inquiry being made, it was found this Brahman woman had had a severe illness, was still suffering from a suppurating gland, and was recovering, in all probability from an attack of plague. It was said she had been ill for a month. She and her family were segregated in their own house, a large and airy one. These two cases were most probably connected.

9026. That was in the first two cases?—I am talking of the woman, the wife of a Nai, who died, and of the Brahman woman, in whose house she had been living. I presume the wife of the Nai contracted the disease whilst living with this Brahman woman.

9027. From whence do you think infection had been introduced?—I can only suggest that it was introduced from Sind. There was plague in Sind, and Sind pilgrims frequented this house in which the first case occurred. That is the only evidence we have that infection might have been introduced from Sind. It is a supposition only.

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9028. Was there any extension of the disease from these cases?—On the 9th a house-to-house search was made in the vicinity of the locality in which these cases had occurred. This search brought to light three suspicious cases. A man was found to have died just before the arrival of the search party; he had enlarged glands. A woman was found suffering from high fever and an enlarged gland in the groin. She was removed to hospital and died after five days with all the symptoms of plague, and bacteriological examination showed the presence of plague bacilli. In a house 80 yards from the last-mentioned case a girl of 10 was found dying with suppurating buboes. All these persons were residents of Hardwar. It was not possible to ascertain with any degree of certainty how the disease was imported, but there appears to be little doubt that it first appeared in the lodging-house above referred to, and it seems probable that it was imported by one of the pilgrims from Sind resorting to this lodging house before special measures had been taken to segregate pilgrims from infected areas. Further cases were discovered on the 15th, 18th, and 22nd, those of the 15th and 22nd occurring in houses in the locality of the first cases, that of the 18th in another part of the town.

9029. What were the measures you adopted?—When any suspicious cases were discovered the houses in which they were found were disinfected, the floors dug up and disinfected, all clothing burnt or disinfected, and all contacts were segregated.

9030. What do you mean by disinfected?—The floors were thoroughly soaked with perchloride of mercury.

9031. They were then dug up?—Yes, and the floor was then removed.

9032. After being first thoroughly soaked with the solution?—Yes; it was thoroughly soaked with the solution and then it was dug up and removed.

9033. That was done after the removal?—The earth was generally spread out in the sun.

9034. You did not adopt burning?—No.

9035. What was the result of these operations; do they appear to have checked plague?—I have mentioned the cases that occurred up to the 22nd, and it did not seem that the disease had been stopped. Several of the cases had occurred in a well-defined locality, and it was decided to evacuate the whole of that locality.

9036. You had never evacuated native houses during the first case?—So far we had not evacuated native houses except the houses in which cases occurred.

9037. What was the result of this more thorough evacuation?—I will show you a map of Hardwar which may interest you. (Witness produced the map* and explained it to the Commissioners.) The cases which occurred in the area we evacuated are not marked on that map, but the cases that occurred outside that area are marked.

9038. Do you mean these cases occurred at the same time or subsequently?—I have already mentioned that there were two cases which occurred outside that locality before that area was evacuated.

9039. What followed the evacuation of this area: was there a reduction of the number of cases, or was this partial evacuation found ineffective?—On the 16th of May there was a case, and there were cases also on the 17th, 18th, 27th, 28th, and on the 30th of May.

9040. In what parts of the town?—You will see them marked on the map, scattered over different parts of the town. There was no defined area; we did not think it was any use to evacuate further areas; if further evacuation had been necessary we should have had to evacuate the whole town.

9041. Did you evacuate the whole town?—No, we never evacuated Hardwar entirely.

9042. What did you do?—These cases were so scattered that it was decided not to evacuate any portion of the town. It seemed scarcely necessary to evacuate the whole of it, and it was undesirable to do so. By the beginning of June the disease seemed to be dying off. There were very scattered cases on the 30th of May, the 1st of June, and the 7th of June. The last case was on the 8th of June; that was a contact case.

9043. Then the disease ceased on the 8th of June?—Yes; although we did not evacuate compulsorily there was to all intents and purposes a voluntary evacuation.

* See Appendix No. XXVIII. in this Volume.

9044. To what extent?—It was difficult to say how many people were left in the town by the middle of June. In my précis I have said that there were less than 500. I should say it was probably nearer 300 than 500, but as they were scattered over a fairly large area it is difficult to form an exact estimate.

9045. Did you take any extensive steps for disinfection?—The whole town, from beginning to end, was disinfected, every house and every room.

9046. Disinfected in the manner described?—We disinfected in the same manner as we did in the evacuated area.

9047. How did you accomplish that when the people lived in the houses?—They turned out for the day. All the property, every article in the house, was disinfected, either with solution or by boiling, or by long exposure in the sun.

9048. When was disinfection of the whole town completed?—The systematic disinfection of the unevacuated portion was really only commenced at the beginning of June, and it was finished, as far as I can remember, by about the 20th of June. I am quite sure of that.

9049. At that time there were only two or three cases?—There had only been two or three cases.

9050. You were not really dealing with an epidemic in the town?—Not when we were disinfecting the whole town.

9051. The result, however, was that there was no recrudescence?—No. At that time there would not be more than 500 people in the town. By August the people would be coming back.

9052. When did you allow them to return?—We never stopped their return.

9053. As a matter of fact, when did they commence to return?—In July. There are, as a rule, very few people there during the rains; in August there are a certain number of fairs, and a certain number of people would certainly come back then. They were allowed to come back, there was no hindrance at all. By the end of August I would suppose there would be a population there of some 2,500 or 3,000.

9054. Take, first, those who had evacuated; do you know how many cases of plague occurred amongst them subsequent to their removal?—We never heard of a case.

9055. Not a single case?—No.

9056. Take only those who did not return to the town. How many cases occurred before disinfecting the town?—We began disinfecting about the 1st of June, approximately. There was one case there: he was an itinerant Sadhu; he was not living in the town; he was living, more or less, in the jungles.

9057. Up to June 8th, there were two cases before disinfection?—One of these was one of the contacts I mentioned; he was not living in the town. There was only one case after the disinfection of the unevacuated portion was commenced.

9058. What was the total number of cases up to the 8th of June?—18.

9059. After this, had you any further cases in Hardwar, the people having now commenced to return?—There were no cases in Hardwar proper until the following Spring, when two cases occurred. In these cases we traced the connection to Jawalapur; they occurred among people who had left Jawalapur when plague had broken out there. One of them was turned out by the owner of the lodging-house in which he was staying. He tried to go away towards Rikhikesh. He only got out one march, and was found dying by the roadside.

9060. There did not appear to be any recrudescence?—No. In neither of these cases did the disease spread: they were both, undoubtedly, imported cases.

9061. Your measures were, therefore, very effective?—Yes, completely, so it appeared.

9062. To what did you attribute the success—to each of your methods, or to a combination of them, or to any special one?—I think the partially compulsory and partially voluntary evacuation probably had a great deal to do with stopping the disease. In addition to that, it was in the middle of the very hot weather, May, when you would not expect the disease to spread very rapidly. I think that the fact that every house and the whole of the property was disinfected was strongly

in favour of the disease not spreading in the case of an imported case or any other case occurring in the town.

9063. I understand you did not employ inoculation at all?—There was no inoculation at all from beginning to end.

9064. You have a statement of the details of all these cases at Hardwar, have you not?—Yes; they are as follows:—

Date of Report.	Place.	Details.
(1.) 8th April 1897.	Hardwar -	The body of a woman (wife of Lekha, Nái) was found in a hut near the high road in Hardwar; it had very enlarged glands in the groin. The glands were sent for bacteriological examination, and were subsequently pronounced to be swarming with bacilli, exactly like that of the bubonic plague. The deceased woman had only occupied the hut for two days, and had previously lived in a pilgrim lodging-house in Hardwar.
(2.) „ -	„ -	On examining the lodging-house referred to in case No. (1), a woman was found in it suffering from a suppurating bubo in the groin; she was evidently recovering from a recent and severe illness.
(3.) 9th April 1897.	„ -	A house-to-house search in the vicinity brought to light this and the two following cases. A man was found to have died in a house just before the arrival of the search party. The body was examined and found to have enlarged glands.
(4.) „ -	„ -	A woman, wife of Fazal Husain, basket maker, was found suffering from high fever and an enlarged gland in the groin. She was removed to hospital, and died six days later. Bacteriological examination disclosed the presence of plague bacilli.
(5.) „ -	„ -	In a house 30 yards from the last case a female child, aged 10, was found dying with suppurated buboes. She was said to have been ill for about a month.
(6.) 15th April 1897.	„ -	A man died suddenly in a house two doors from one of the previous cases. He suffered from fever of six hours' duration and displayed enlarged glands.
(7.) 18th April 1897,	„ -	A man was found in quite another part of the town with unusually large buboes and a temperature of 109°. He was placed under treatment, but died in 36 hours. Two days previously he had been employed in cooking cakes in the area in which the above cases occurred.
(8.) 22nd April 1897.	„ -	Asa Ram, a Sadhu, aged 20, was found in a large dharamsala with slightly enlarged glands and temperature of 102°. He was attended by a mahant and hakim, who thought it a simple case of fever, but died on the second day.
(9.) 16th May 1897.	„ -	On the 7th May, Kishan Ram, a pújári, was present at a house in the infected area while the house and its contents were being disinfected. Among the contents were some vestments belonging to the temple of which Kishan Ram was pújári, and it is suspected that he either slept that night in the house or on the clothes in the verandah. Kishan Ram was taken ill on 14th May at the temple of which he was pújári, and to which he had returned. He removed to an empty house, where he died on 16th May. Professor Haffkine, to whom specimens of blood were sent, reported that he discovered large numbers of plague-like bacilli. A guard of Brahmen constables was placed over the temple to prevent access to it, a pújári being allowed to visit it morning and evening.
(10.) 17th May 1897.	„ -	Musammat Saiji, wife of a Banniah living not far from the temple of which Kishan Ram (case No. 9) was pújári, and in the vicinity of the bathing pool, but outside the infected and evacuated area, was found in a moribund condition, and died on the 18th May. This case also presented characteristic symptoms of bubonic plague, and Professor Haffkine, to whom specimens were sent, reported the presence of large numbers of plague-like bacilli.
(11.) 18th May 1897.	„ -	A man named Saudagar, living in a hut at some little distance from the infected and evacuated area was reported to be ill with suspicious symptoms. He was taken to the hospital, and after showing some signs of recovery, died on the 21st May. Three doctors pronounced this to be a case of plague.
(12.) 27th May 1897.	Hardwar -	A man named Shama, dahiwala, living in the main lower bazar outside the infected and evacuated area, went on 25th May to a neighbouring village, five miles off. He had fever at the time, and a gland developed itself on the 26th. He walked back, however, to Hardwar on the 27th, and walked to the hospital. The symptoms of plague became more marked, and he died on the 29th.
(13.) 28th May 1897.	„ -	Bhinga, topiwala, also living in the main bazar, was ill with fever for 15 days, during which time he was seen by the medical officers on duty, who did not at first consider it to be a case of true plague. He was removed to the observation huts, and died on 29th May. On the 28th a sub-lingual gland was found to be unmistakably enlarged, and the medical officers agreed that it was a case of plague.
(14.) „ -	„ -	Turi Ram, who had been living in various parts of Hardwar during the last two months, went on the 18th May to a place called Rikhikesh, about 13 miles from Hardwar. After staying eight days at Rikhikesh he left on the 27th May for Hardwar, but was found lying on the road near Hardwar, too ill to reach the town. He was removed to the Plague Hospital. His temperature was 103°, and an enlarged gland was noticed. He died on the evening of the 29th. No suspicious cases had occurred at Rikhikesh.
(15.) 30th May 1897.	„ -	A man named Jammu died in the main bazar from what is believed by the medical officers to have been plague with pneumonic symptoms.
(16.) 1st June 1897.	„ -	Uggar, an itinerant Sadhu, was found on the road one mile from Jawalapur, with fever and enlarged glands. He had been staying at Rikhikesh, and had left 10 days previously. On arrival at Hardwar he wandered about and had slept for some nights, it is believed, in a house near Gaoghat. He was admitted to hospital, and was reported on 11th June to be doing well.
(17.) 7th June 1897	„ -	A beggar woman named Pathai, living in a dilapidated house in a grove near Kankhal, but frequently visiting Hardwar, was found lying in the house with high fever, and a large femoral gland. She was removed to hospital, where she was reported on 11th June to be doing well.
(18.) 8th June 1897.	„ -	Dadri, servant of Shama (case No. 12), who had been placed in the segregation huts, died on 9th June. He had been ill some days with fever, but did not show plague symptoms; his lungs, however, were affected, and it was reported that there could be little doubt that he died of plague.

9065. Now we come to Kankhal. When did the first case occur there?—The first case was reported on the 16th September 1897; that is the first case in the Kankhal outbreak; before that, two cases had occurred in Kankhal during the Hardwar outbreak.

9066. Were you able to trace their origin?—One was the case mentioned in the Hardwar list, Kishan Ram. Kishan Ram was the pujari, or priest, of one of the temples near the sacred pool in Hardwar. He was present at the disinfection of a house in the infected evacuated area. It was our custom, when a house was being disinfected, to call up the owner to be present to see what was done, and to see that there was no theft, and so on. Kishan Ram, in accordance with that practice, was called up. There was two things we suspect. He may have taken away clothing surreptitiously from the house. There were vestments belonging to the temple there, and he may have been anxious to prevent them from being disinfected, and he may have, therefore, removed them, and taken them off to his temple. It was also suggested to us that, as the house took nearly two days to disinfect, he slept in the house, or in the verandah, during the night. I cannot say which of these two suspicions is true.

9067. When was the disinfection done?—On the 7th of May.

9068. And he became ill, when?—Kishan Ram was taken ill on the 14th.

9069. Did he recover or die?—He was removed surreptitiously to Kankhal, and he died there on the 16th. I think his body was only found after death; it

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was found in a more or less dilapidated house—one of a row of similar houses in Kankhal.

9070. Were any cases caused by this importation in Kankhal?—My own idea is, in all probability, that was the origin of the Kankhal outbreak.

9071. Was the season of the year favourable for the spread of the plague in Kankhal?—It was the middle of May, when it is very hot and very dry, and people are sleeping out of doors all night, and they are probably out in the air all day. They scarcely use the interior of their houses at all; therefore, I should say it was unlikely that plague should spread rapidly at that time of the year.

9072. To what extent did it spread?—About the middle, or the 20th, of June, I heard rumours that rats were dying in very large numbers. Kishan Ram died on the 16th of May.

9073. You had no cases of plague till when?—We had no verified case until the 16th of September.

9074. In the interval rats were sick?—In the middle of June we heard that rats had been dying in Kankhal in very large numbers. We made inquiries, and there was no doubt that rats were dying, but to what extent they were dying I was unable to ascertain. The people knew the meaning of the dying of the rats, and they took every possible measure to conceal it. I can give you an instance to show how they concealed it. One of the natives who had reported the mortality among rats to me, said that a large number, 50, died in his own house. I said: "The next time you see any dying bring them to me." The next day he came up, and said: "I have got four rats, which died in my house "last night; they are being brought up by a boy "behind me." This man had ridden on in front of the boy, and we waited, but no boy appeared. He therefore went back, and he discovered that some residents of Kankhal had found out what the boy was carrying in his basket, and they had thrown the rats into the river.

9075. Were any rats examined bacteriologically?—Rats which were subsequently obtained were examined, and they were said to have died of plague.

9076. At what time in June was this?—About the middle of June.

9077. But still no case of plague occurred in human beings till when?—The first verified case occurred on the 6th of September. I was away at the time, on leave. I got back on the 20th or 21st. I made very careful inquiries into the details of all deaths that had occurred since June, and the result of these inquiries led me to think that there had been cases of plague in Kankhal before the 16th. I obtained the details of some six cases which, in my opinion, were plague cases. The first of these six cases occurred about the 3rd or 4th of August. Subsequently there were one or two cases in August, and one on the 11th of September. I remember too that there was what was reported as a fatal case of mumps just before we arrived. That was probably a case of plague.

9078. You made these inquiries in the middle of September?—I made these inquiries from the 20th to the 25th of September.

9079. So that the cases which occurred anterior to September were difficult to trace?—Yes.

9080. Cases might have occurred between June and August without you being able to trace them?—I do not think there could have been many, if any, other cases. The reporting agency, I think, is good in Kankhal. We had a list of all the deaths. In the cases I suspect were plague cases, the deaths had not been concealed; they were properly reported in the Police Station. I imagine, therefore, that all the deaths which occurred were properly reported. It was only in the case of these six cases that the circumstances connected with the death were suspicious. The mortality, if anything, was low. The following are notes of the more interesting cases that occurred during the Kankhal outbreak:—

(1) On the 29th September a man was found suffering from plague and was removed to hospital about midday. His brother, apparently quite well, accompanied him to the hospital, walking there. by 2 o'clock he had fever, in the evening an enlarged gland was noticeable, and he died at 2 o'clock in the morning. In specimens taken from this case the plague microbe was found, though it was not found in the specimens taken from his brother, who, however, almost undoubtedly died from plague.

(2) A woman, who recovered, was attacked on the 10th October in the Acharj camp, which consisted of people who had been evacuated on the 8th October. She undoubtedly brought the infection into camp her.

(3) On the 12th October a case occurred in a family which had been isolated a few days previously on account of a suspicious death.

(4) On 13th October the servant of one of the patients in hospital and attending on him was attacked.

(5) On the 14th October a case occurred in the Imli evacuation camp, formed some three days previously.

(6) A Municipal chaukidar was attacked on the 16th October; he had been placed on guard over a house in which a case had occurred. He stated that at night, when off duty, he slept inside this house. During the day he mixed with his family, who lived in a courtyard in which two deaths had occurred a few days previously, which, though not diagnosed as plague at the time, were now viewed with suspicion.

(7) In the Rajghat block, which was evacuated owing to its being infected, a family of Chamars were allowed to remain, as a child had just been born and removal was considered inadvisable. On the 15th a member of this family was attacked with plague and died on the 16th.

(8) Another family was similarly left in the Imli block, and one of its members was attacked with plague on the 16th.

(9) A chaukidar, on patrol duty in the infected area, was attacked on the 17th.

(10) A family of a respectable, well-to-do Brahman lived in a house adjoining an infected and evacuated area. The house was well built, and scrupulously clean, and, as a special case, was not evacuated with the rest of the muhalla. Two members of this family were attacked, one of whom died.

(11) In another house a man was attacked with plague, but as at the time of the discovery his wife was about to be confined the family were segregated in their own house. Five members of the family, consisting of some nine persons, were attacked with plague.

(12) On the 6th a woman who had been in an evacuation camp for four days was attacked.

(13) A man who had been in an evacuation camp for nine days was attacked. He was the only man attacked in this camp, and there was nothing to suggest how he caught the infection.

(14) Early in November two cases occurred among the disinfecting staff.

(15) On the 9th November a compounder, Suraj Bhan, was attacked. Though a camp had been provided for the medical staff, he persisted in living in houses in the town.

(16) One of the last cases that occurred was a woman who was permitted to remain in a temple with her brother. The temple had been disinfected by the brother, who probably did not do the work properly.

I may add, perhaps, with regard to Kishan Ram, that the house in which his body was found was disinfected, and also the houses adjoining. My own suspicion is, that, as would be their natural course, Kishan Ram's friends, leaving Hardwar probably in the middle of the night, would not take him to the empty house, but to the house of some friend. Then when they thought the man was dying, and concealment was impossible, they turned him into an empty house. I merely put that forward as a supposition; we have had similar cases.

9081. In Kankhal?—No. I can name a case at Jawalapur.

9082. Now with regard to this case in September, will you kindly give us some details?—The man who was ill, Sundar Shah, was the servant of the son of a Nepalese General who for some months had been living in Kankhal. Sundar Shah, himself, had been in Kankhal for three weeks only. He had been an old servant of the General's but had been separated from him somehow, and had joined him again in Kankhal. On his arrival in Kankhal, I ascertained he put up in a house within 15 yards of the house in which Kishan

Ram died; that he stayed there some days before he was taken on as a servant, and that he then moved to a house about 50 yards from the house in which Kishan Ram died. Finally, when he was taken on as servant, he moved to a house about 100 yards away.

9083. Before this time the house of Kishan Ram had been disinfected?—The house in which the body was found had been disinfected.

9084. Was there any plague in Hardwar at this time?—Not in September.

9085. Did this man die or recover?—He died on the 19th.

9086. Are there any cases originating from this one?—On the same day that Sundar Shah died, the son of the General, Sundar Shah's master, was attacked. He died on the 21st.

9087. In what kind of a house did he live?—A large, well-built, masonry house.

9088. What would be the opportunities of contact between the servant and the master?—I think he was more or less a personal servant; the contact was close.

9089. Did this gentleman live or die?—He was taken ill on the 19th, and died on the 21st.

9090. What steps did you take when you found plague was present in Kankhal?—These two cases occurred, and Kishan Ram died in the same locality, and rats had died in the same locality. Several of the previous suspicious deaths of which I have told you, but of which we have not definite evidence that they were plague, also occurred very close to this house, within 40 or 50 yards. There were two cases in one house, and another suspected case in the same compound. We then selected a defined area including these houses, and evacuated it and followed this up with a disinfection of the houses inside the area. We did this on the principle adopted in Hardwar.

9091. Was that effectual?—No: fresh cases occurred outside that area.

9092. Then what did you do?—When two or three cases occurred in a definite area we marked off that area and evacuated it. There was a series of camps. We kept the inhabitants of each evacuated area in a separate camp, and of course the people living in the houses in which the plague cases had occurred or even in the same compound, were put into a separate segregation or contact camp.

9093. To what extent was this town evacuated altogether?—Ultimately we evacuated the whole town.

9094. Why?—Because the cases went on occurring and spreading in different parts of the town. We felt that the measures taken had *not* been successful in stamping it out, and that it must end in evacuation of the town; and, therefore, decided that the sooner it was done the better.

9095. Did you have any difficulty in accomplishing this evacuation?—Practically, none.

9096. How did you manage it?—The first day, when the Satighat block was evacuated, I sent down a police officer who collected a certain number of chaukidars, and then I followed myself. I called up the leading men of the place into a private room and explained what I was going to do, and the necessity for it. They agreed, and came round with me. I then rapidly put a cordon of chaukidars round the infected area in order to prevent any of the people in that area for the time being getting away before I could evacuate them. I then made a list of the inhabitants of every house, in which I got some of the leading men of the place to help me. I think that was made quite accurately. Then I sent down a number of carts. I went round to every house at that time and personally explained to each family what had to be done and why, and gave them so many hours in which to pack their things. We carted them off to the camp which was ready for them, and it was all over before the evening. In the first evacuation I got to the town at one o'clock, and the people were all out that evening.

9097. How many houses do you think you evacuated?—There were about 300 people on the first occasion.

9098. I mean the total number of houses in the whole town which you evacuated?—I cannot tell you.

9099. On the first occasion how many houses did you evacuate?—I cannot tell you from memory. We had registers prepared, but I cannot remember what was the number of houses.

9100. How many people?—Each evacuation varied, but from 150 to 300 or 400 people were evacuated on each occasion.

9101. How many evacuations did you have?—We had a series, I suppose 10 or 11.

9102. Each of these was successful, and finally you accomplished the whole evacuation?—Some of the latter evacuations were not on account of the occurrence of any special case, but because we had decided to evacuate the whole town, as our camps were ready. Complete evacuation was finished, to all intents and purposes, by the end of October. I think there were only 200 people left at the end of October

9103. How long do you think it would take to evacuate a town if you had the camps ready?—I suppose a couple of days, if you had everything ready, with a supply of carts, and so on.

9104. How long would it take to prepare camps?—That varies according to the time of year. At that time of year it was very difficult to get materials to build the huts with. It was in the rains. The grass had not been cut, and I had to collect material from all parts of the district, and that delayed matters.

9105. What was the minimum time to make a camp?—I do not think that I could do it very much quicker than I did, notwithstanding the difficulties we had.

9106. How long, about two months?—No; we did not commence till the beginning of October, about the 3rd or 4th.

9107. When was it completed?—The evacuation was completed say on the 1st of November, that was within a month. Meanwhile we had not made up our minds that it would be necessary to evacuate the whole town; and, therefore, I did not in the first instance collect materials sufficient for that. It was only about the middle of the month that it was finally decided to evacuate the whole town.

9108. You might have done it all in about a fortnight?—Yes, if I had known at the beginning that it would have to be done.

9109. You had, however, the advantage that you had no great difficulty in persuading the people to go out?—No; I had a number of leading men, natives, who worked loyally with us. There was a little objection on the first day, people crowded round and tried to make a rush, but it was very soon over, and after about the third evacuation, the residents of one muhallah came up to me to send them out into camp. I told them to make their own camp, but they said no, the Government was evidently going to evacuate the whole town, and they would rather the Government provided them with a camp.

9110. Had you many religions to deal with?—No; they are almost entirely Hindus there. There are a few Muhammadans, but usually of low caste, and they gave no trouble.

9111. What was the the result of that evacuation? I understand the cases were going on while it was being carried out?—The cases were going on.

9112. Until you had completely evacuated?—Until we effected a complete evacuation.

9113. And after that?—After evacuation a few cases occurred in the camps, and the end of the epidemic was in December. It would have been over before, but unfortunately we have left a collection of some half-a-dozen houses on the outskirts of the town, separated from the town, which we had not thought it necessary to evacuate, and a case of plague occurred there. Three members of that family, after being taken to a segregation camp, died of plague. Subsequently to that there was only one case, and that was of the mother of a Sub-Inspector of Police. That occurred in a house right on the boundary of our cordon at Kankhal, and quite separated from the rest of the town.

9114. Did you ascertain how the last case became infected?—I do not know how she caught the disease.

9115. Were all these evacuated houses disinfected soon after evacuation?—As soon as we could do it.

9116. How long after?—The disinfection of the houses and goods was completed on the 13th of November.

9117. When did the people commence to go back?—I did not allow them back till the 15th of February.

9118. What kind of habitations had they in the camps?—We made the camps exceedingly comfortable. After a time they were allowed to go to Hardwar and Jawalapur. Plague had broken out in the village of

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Jagjitpur, almost adjoining Kankhal, and closely connected with it, and later on at Jawalapur; and we thought, having put the people to so much inconvenience, and gone to such a great expense, it was better to keep them for another fortnight than risk re-infection from Jagjitpur.

9119. During the time this epidemic was most severe, I understand you also had some illness from plague among monkeys?—Yes; that was about the middle of October. I was astonished to find one or two bodies of dead monkeys lying about the town. It is almost an unheard of thing to find the dead body of a monkey; the natives will tell you the same thing; they are quite astonished to see them.

9120. Do monkeys haunt this town?—Yes, there are great numbers of them in the town. In the course of a month I think we discovered some 25 dead bodies in the streets or near the houses.

9121. Did you make it quite certain that the monkeys had died from plague?—A *post mortem* was made, I remember, in one of the earlier cases, by Dr. Elphick. You will have his evidence upon that. I was present at the time. He discovered certain symptoms which led him to believe that there was no doubt that the monkeys had died from plague.

9122. Was there any further evidence?—It was also confirmed by Mr. Hankin, and I think by Mr. Haffkine. About 25 died altogether, but only a certain number were microscopically examined.

9123. Some five of them, I think?—Five cases were proved to have been cases of plague. My own idea was that, as we found 25 bodies of monkeys, the probability was that a considerable number more had died, because they would naturally go and hide away somewhere, and their bodies would not be found because they would be devoured. Wild animals generally go to some unfrequented place to die.

9124. You considered they might extend the disease?—My idea was that if they got plague they would probably infect the houses we had disinfected, and that when the town was re-occupied there might be a fresh outbreak, and we therefore took measures to catch the monkeys.

9125. You caught a very large number I think?—Yes, we caught about 650.

9126. And you kept them for some time?—Yes, in 16 cages.

9127. In the open air?—Yes, on some waste land at the foot of the hills, separated from Hardwar by the railway in a large open space there.

9128. A good many died?—Yes, as the result of fighting as soon as they were put into the cages.

9129. Have you got a statement of cases similar to that which you have put in with regard to Hardwar?—No. I am afraid I have been unable to compile a statement; in the note I have given you I have merely noticed a few of the more interesting cases.

9130. It is not complete?—No.

9131. Can you tell us the total number of cases at Kankhal?—I think 61. I have been endeavouring to make out a complete statement but I have not got it finished yet.

9132. I will ask you to put in a statement similar to that which we had from Hardwar. I will endeavour to do so. [Note by witness on correcting proof of his evidence:—I enclose a list of the 61 cases that occurred in Kankhal. I have not been able to ascertain the date of death in all cases.]

Serial No.	Name.	Where attacked.	Date of Attack.	Date of Death.	Remarks.
1	Sundar Sah	Town	15th September	19th September	
2	Dalmeg Rana	„	19th September	21st September	Master of case No. 1.
3	Parsuni	„	22nd September	Recovered	
4	Champa	„	23rd September	26th September	Sister of Hospital Assistant Lachmi Chand.
5	Ganga Sahai	„	24th September	Recovered	
6	Jhandu Mal	„	26th September	27th September	Grandfather of case No. 4.
7	Fattah	„	„	26th September	Found dead.
8	Bidhia	„	24th September	27th September	Sister of case No. 4.
9	Durga	„	27th September	28th September	
10	Gauri	„	26th September	„	
11	Chhota	„	28th September	Recovered	Acharj.
12	Jagan	Segregation camp, 29th September.	29th September	29th September	Acharj. Brother of case No. 11.
13	Manu	Town	3rd October	5th October	
14	Manu	„	„	—	
15	Baru	„	4th October	7th October	
16	Jainti	„	7th October	8th October	
17	Kura	„	„	9th October	Acharj.
18	Jawali	„	9th October	11th October	„
19	Hardat	„	5th October	9th October	
20	Maru	„	—	—	
21	Ganga Dei	Evacuation camp	—	—	Acharj.
22	Ganga	Town	10th October	12th October	
23	Kishen Dei	„	6th October	11th October	
24	Salag	„	12th October	13th October	
25	Deva	„	9th October	11th October	
26	Jewni	„	11th October	—	Dai.
27	Kashi Ram	Segregation camp	14th October	15th October	
28	Nanki	Evacuation camp	13th October	—	Acharj.
29	Salaku	„	„	15th October	Brother of case No. 28.
30	Parsunni	„	12th October	—	Acharj.
31	Bhagwan Dei	Segregation camp	11th October	14th October	„
32	Mohan	Town	16th October	—	
33	Tapu	„	15th October	16th October	
34	Khusla	„	„	15th October	
35	Khushi	„	13th October	—	Chaukidar on infected house.
36	Ehsan Ali	„	14th October	—	„ „
37	Punnia	„	16th October	17th October	
38	Nanna	Segregation camp	20th October	—	Husband of case No. 37.
39	Nanni	Town	—	—	Found dead in occupied house in evacuated area.
40	Surjan	„	19th October	—	
41	Jewni	Segregation camp	20th October	Recovered	Mother-in-law of case No. 39.
42	Gulabi	Town	21st October	22nd October	
43	Surji	Evacuation camp	23rd October	—	
44	Mansa Ram	Town	25th October	27th October	
45	Multani	—	26th October	—	Disinfection coolie.
46	Baru	Evacuation camp	„	27th October	
47	Dani Ram	Segregation camp	25th October	Recovered	Father of case No. 3.
48	Sibi	Town	27th October	—	
49	Chiri	„	28th October	+	
50	Mani	Evacuation camp	29th October	—	
51	Bhagirati	Town	31st October	1st November	

Serial No.	Name.	Where attacked.	Date of Attack.	Date of Death.	Remarks.
52	Parbati - -	Evacuation camp, 2nd November.	5th November	—	
53	Suràj Bán - -	(Town) - -	8th November	—	Compounder on disinfection duty.
54	Bahudda - -	- - -	10th November	—	Disinfection coolie.
55	Kallu - -	- - -	10th November	11th November	„ „
56	Parbati - -	Temple in evacuated area.	6th November	—	
57	Nathu - -	Town - - -	12th December	12th December	
58	Taju - -	Segregation camp -	13th December	15th December	Sister of case No. 57. These two lived in huts on outskirts of town.
59	Chattri - -	„ - -	20th December	20th December	Husband of case No. 58.
60	Mt. Mankur - -	„ - -	25th December	26th December	Mother of case No. 57.
61	Killo - -	Town - - -	6th January 1898.	8th January 1898.	Lived in an isolated house.

9133. To what other villages did the plague extend?—Besides Jagjitpur there was an outbreak in Jamalpur. I think I may say these were the only villages in which there were the outbreaks in epidemic form. A few cases occurred in several other villages—Bahadarpur, Dhanpura, Ranimazra, Smithnagar, Mustafabad, and Sakrasa.

9134. In these several villages your measures were sufficient to detect the cases early?—I think we discovered, if not the first one, at any rate one of the very earliest cases in each village. Immediately on the discovery of a case we took measures which were apparently sufficient to prevent the plague spreading. We took a large area round the infected house and evacuated it, and put the people into a camp. As a rule we burnt the house down on the spot in these villages. I am talking of those villages in which solitary cases occurred, where there was no epidemic.

9135. In which villages did an epidemic occur?—In Jagjitpur and Jamalpur.

9136. Were those important outbreaks?—Yes, both of them were important.

9137. Have you traced the origin of those outbreaks?—It is very difficult to say how plague got into Jagjitpur. The first case occurred on the 29th December, but the mortality during that month had been high; and this leads me to suspect that during the course of the month there had been several other cases of plague. On a house-to-house search being made, a woman was found to be recovering from what apparently was an attack of plague. She had been ill for some time, and had left Kankhal before we placed a cordon round it.

9138. Kankhal is only a short distance away, I think?—A mile-and-a-half away.

9139. Was there any mortality among rats before this?—I have received no report of it.

9140. To what extent did the epidemic proceed at Jagjitpur? You found very few cases, I believe?—We had about 23.

9141. How many of those had occurred before you commenced to evacuate?—There was a case on the 29th, two on the 30th, and two on the 31st, and there were 23 cases in all.

9142. Before you commenced to evacuate?—No, altogether. There were 10 cases before we evacuated.

9143. You had a sufficient number to induce you to take that measure?—We decided to evacuate when there had been five or six cases. The village consisted, with the exception of one or two houses, of mud huts and thatched huts.

9144. Was that a small village?—About 1,200 inhabitants.

9145. Was your evacuation complete or partial?—Complete, and it was carried out at once, as quickly as we could do it. Evacuation was commenced somewhere about the 5th of January and completed on the 8th. It took us about three days. We had a large collection of huts left over from Kankhal, and I moved them over to Jagjitpur.

9146. Did you experience much difficulty in inducing the people to leave?—No; they objected, but there was no serious objection.

9147. After the evacuation 13 cases occurred?—Yes.

9148. Have you any information as to the dates of the occurrence of these cases? Did they occur soon after evacuation?—Yes, mostly soon after removal; with one or two exceptions, within a few days.

9149. They had probably acquired the disease in the town?—Yes.

9150. Now we come, in the next instance, to Jamalpur, which was a more serious outbreak, I think?—Yes.

9151. When did the first case occur?—A girl, Hanna, was found ill on the 12th February.

9152. What was the origin of that case?—A few days before this girl was found her father had bought grain in Jawalapur. That is the only thing we could find out.

9153. Was it known from what house the grain had been obtained?—I think we did obtain that information but it led no further. It was not from a house in which we knew that a case of plague had occurred, but plague had broken out in Jawalapur before that date.

9154. You made an exhaustive inquiry?—Yes, but we failed to trace anything more direct than that a few days previous to the girl's illness her father had been to Jawalapur and bought grain. I do not say it was the grain which conveyed the infection, he may have brought the infection from some house which he visited.

9155. How far did the plague extend?—There were 34 cases. The first case occurred on the 12th February, the second case occurred on the 19th of February, seven days afterwards. They were in the same part of the village.

9156. Very close?—Probably about 40 or 50 yards apart.

9157. Have you reason to suppose that there had been personal contact?—No, I do not think so, any more than there would be among the inhabitants of a small village.

9158. Then the third case?—The third case, Bechu, was a member of a disinfection gang. He was attacked on the 25th February. We had sent regular disinfection gangs to the village immediately the case of Hanna occurred, and started disinfecting the houses in the neighbourhood. The next case was Rama, also a disinfection cooli, who was attacked on the 28th of February.

9159. When did you commence to evacuate?—On the 13th or 14th of February.

9160. Before that, how many cases were there?—One case.

9161. You commenced immediately after the first case?—That was our practice. After seeing the results of the evacuation at Kankhal and Jagjitpur we thought it better to evacuate a considerable block immediately on the occurrence of a single case. The whole village was ultimately evacuated.

9162. Did cases subsequently occur in the village?—Cases 5, 6, 7, and 8 occurred in the village; that brings it down to the 10th of March.

9163. And the others occurred in camp?—Yes.

9164. Cases occurring in camp seem to have continued till towards the end of April?—Yes; the last case was on the 18th April. I put in a list of the 34 cases that occurred in Jamalpur Of these, 10 occurred

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within the village, 11 in the evacuation camp, 10 in the contact camp, and in three cases members of disinfection gangs were attacked. The date of death has not in all cases been entered, the information was not available from the records at my disposal at the time of writing. The population of Jamalpur, as ascertained shortly before plague made its appearance there, was 1,426.

Number.	Name.	Where attacked.	Date of Attack or Discovery.	Date of Death.	Remarks.
			1898.	1898.	
1	Hanna, Koli	Jamalpur	12th February	13th February	
2	Musammat Pero	„	19th February	—	
3	Bechu	Disinfection camp	25th February	—	A member of disinfection gang.
4	Rama	„	28th February	4th March	A disinfection coolie.
5	Musammat Shahzadi	Jamalpur	4th March	8th March	
6	Chanda, Juláhá	„	8th March	—	
7	Musammat Mangli	„	„ 9th March	9th March	
8	„ Lado	„	10th March	—	
9	„ Bhoria	Segregation camp	11th March	—	
10	Chajju, Dhobi	Jamalpur camp	16th March	17th March	
11	Musammat Uddi	„	„	—	
12	„ Tulsha, Dhobin.	Jamalpur	„	17th March	
13	Harkesh	Segregation camp	„	—	
14	Musammat Bhagirati	Camp	14th March	—	Wife of Chajju, chaukídár.
15	„ Indrawati	„	13th March	—	
16	„ Darbo	Jamalpur	17th March	—	
17	Ganga Dei	„	„	—	
18	Mariam	Jamalpur camp	18th March	—	
19	Ram Kuar	„	„	18th March	
20	Musammat Jamni	„	„	„	
21	Tulshi, Dhobi	Segregation camp	20th March	22nd March	Brother of Musammat Tulsha, case No. 12.
22	Umar Singh	Jamalapur	„	21st March	
23	Musammat Marhi	„ camp	23rd March	24th March	Wife of Hari Singh and mother of case No. 22.
24	Bir Singh	Segregation camp	21st March	25th March	Microbe found.
25	Musammat Babbo	„	25th March	„	Daughter of Umar Singh, case No. 22.
26	„ Lalli	Jawalapur camp	28th March	—	
27	„ Jawahro	Camp	30th March	31st March	Wife of Jawahar, Koli.
28	„ Mari	Segregation camp	31st March	4th April	Wife of Chajju, Dhobi, case No. 10.
29	Ali Bakhsh	Observation hut	1st April	—	He was working in disinfection gang.
30	Musammat Rulli	Observation hut, camp of segregation.	3rd April	—	Sister of Musammat Badamo, who died of plague, case No. 32.
31	Murli, son of Behari, Chippi.	Camp	12th April	13th April	He was attacked in the same hut where Tara Chand, his brother, died of malarial fever on 8th April 1898. Tara Chand probably died of plague.
32	Musammat Badamo	Observation hut	13th April	14th April	Wife of Murli, Chippi, case No. 31.
33	„ Gouri	Segregation camp	17th April	20th April	Wife of Tara Chand, Chippi, who was brother of Murli, cuse No. 31.
34	„ Choti	„	18th April	„	Mother of Murli, Chippi, case No. 31.

9165. Cases went on for a long time?—Yes, but you will observe the disease seemed to run through families; it did not spread much to people outside the families originally attacked. Cases from 21 to 34 you will find were all related to some previous case.

9166. They were communicated cases?—Yes.

9167. Communicated cases which had occurred in camp?—Yes, they were related to one another. On the 22nd Tulsi died; he was the brother of Musammat Tulsi, who died on the 17th March, and so on.

9168. Did you adopt very careful measures of segregation when cases occurred in the camp?—The hut was immediately burnt down, and the people living in the hut were immediately removed to the segregation camp, and everything was disinfected—their clothing, and so on. We dug up the soil where the hut had been just as we did in the villages, and then put thorns over the site of the destroyed hut to prevent people walking on it.

9169. Do you think you obtained early information of the cases which occurred in the camp?—I think so. I do not think any case escaped us for more than a day. There was a list made of the occupants of each hut; there was a roll-call morning and evening, and there were two Hospital Assistants appointed, who inspected everybody in the camps morning and evening.

9170. I suppose the majority of the cases you have spoken of were ordinary bubonic cases?—Yes.

9171. But you then commenced to encounter cases of pneumonic plague?—Yes, after January.

9172. Did you have many pneumonic cases?—I think Dr. Elphick or Dr. Chaytor-White will give you the exact numbers.

9173. Will you tell us about Jawalapur?—The first case was reported on the 9th of January. Before that we had been searching Jawalapur very carefully indeed. There was a Commissioned Medical Officer in charge of the town, and he inspected nearly all of the sick people and all the corpses. The first case we discovered was on the 9th of January. It seems probable that this was an early, if not the first, case, because there was no further case in the town till February. I was unable to trace the source of infection. The patient was connected, to some extent, with Kankhal, but I do not think that is sufficient for me to say that he got infection from Kankhal. We evacuated a block at once; we did not wait for any further cases. We hoped that might be sufficient to save the town. We started disinfection at once.

9174. But that was not effective?—No.

9175. Then you had cases spreading; what further measures did you then adopt?—On the occurrence of each case we evacuated a fresh area. I then started the disinfection of the whole of the town without evacuation, but that was not sufficient; cases occurred very rapidly. We attempted to stop the disease by the thorough disinfection of the whole town, but by that time the cases were spreading, and it seemed advisable to encourage the people, as far as possible, to evacuate the town voluntarily.

9176. Do you know if any cases occurred in the houses you had disinfected?—Only in the last case but one of the epidemic—this occurred in a house which had been disinfected; that was after the town was re-occupied. I cannot say how the infection originated in that case.

9177. You found it necessary to resort to complete evacuation?—Yes, but it was a voluntary evacuation; the people built their own camps.

9178. Was the result satisfactory?—On the whole it was satisfactory, inasmuch as the disease was practically stamped out by the end of April. There were but few cases after that. The following is a note I have written which gives the facts connected with Jawalapur:—

"I produce a statement which shows for Jawalapur the average number of persons each week in the segregation or contact camp, and the number of cases of plague that occurred week by week in the camp. There were 24 such cases in all. Only two of the these died in the camp; the rest of the cases were, as soon as they were discovered, removed to the Plague Hospital. Only one person died from any disease other than plague in the contact camp.

STATEMENT showing AVERAGE WEEKLY POPULATION of CONTACT CAMPS at JAWALAPUR and WEEKLY NUMBER of PLAGUE ATTACKS.

Month.	First Week.		Second Week.		Third Week.		Fourth Week.	
	Average Population.	Number of Plague Cases.	Average Population.	Number of Plague Cases.	Average Population.	Number of Plague Cases.	Average Population.	Number of Plague Cases.
January - -	—	—	9	—	11	1	10	1
February - -	22	—	27	3	52	2	120	1
March - - -	148	1	139	4	92	1	125	4
April - -	138	4	131	—	78	2	26	—
May - - -	12	—	9	—	9	—	8	1
June - -	7	—	4	—	—	—	—	—

"In nearly all the cases of plague which occurred in the contact camp the persons concerned were near relatives of persons who had been attacked in the town or private camps. They were attacked within a very few days of their admission into camp, and in all probability were infected before they arrived there. I cannot verify the fact, but I remember no case in which it was at all probable that the disease was contracted in the contact camp.

"The population of Jawalapur at the last census was over 16,000. This was, however, in excess of the normal, as the census was taken shortly before a large fair, and when there were several large marriage parties in the town. From the time plague broke out in Hardwar and Kankhal, and precautionary measures were adopted in Jawalapur, people had been leaving the town. I estimate that when plague broke out there were not more than some 13,000 persons living there, and in February there were actually some 12,000 only as ascertained. When the evacuation took place, a considerable number of persons had left the town when the first case occurred. There were only a few cases of plague in January and May, and I therefore take February, March, and April as the months in which plague was epidemic. The total mortality from all causes in each of these months was 56, 85, and 81, which gives a rate per mille of 56, 85, and 81 respectively. The number of deaths from plague in the same months were 22, 46, and 19, which gives a death rate from plague of 22, 46, and 19 per mille, and of 34, 39, and 62 from other causes. The death rate in Jawalapur in the previous four years was as follows:—

1894	- - -	44 per mille.
1895	- - -	26 „
1896	- - -	43 „
1897	- - -	43 „

"I produce a list, giving some details of the cases of plague that occurred in Jawalapur. I have not been able to enter the date of death in all cases, as the information was not immediately available. This list shows 116 cases in all. Of these, 31 cases occurred in the town, 30 in the evacuation camps, 24 in the segregation or contact camps, and 29 cases were of persons connected more or less with the work of disinfection. The persons included in this number were either directly engaged in the work of disinfection or in removing rubbish, or were related to some one so engaged and resided with him. In cases No. 57 and No. 75 the sons, and in case No. 66 the mother, of a disinfection coolie were attacked, though the coolies concerned did not themselves catch the disease. These are further instances of persons conveying infection, though they were not themselves infected.

LIST of JAWALAPUR PLAGUE CASES.

Serial Number.	Name.	Where attacked.	Date of Attack where this could be ascertained, otherwise Date of Discovery.	Date of Death.	Remarks.
			1898.	1898.	
1	Gokul, Banniah -	Muhalla Mahban -	9th January	10th January	
2	Jawahir, Banniah -	Muhalla Lodha Mandi, attacked in segregation camp.	17th January	17th January	
3	Ibrar Husain, Hospital Assistant.	In Plague Hospital -	19th January	19th January	Inoculated while making a *post mortem*; he recovered.
4	Bhawani, woman -	In segregation camp -	26th January	26th January	Mother of Gokul, case No. 1.
5	Mukandi Banniah -	Muhalla Mahtar - -	2nd February	3rd February	House situated on boundary of evacuated block.
6	Musammat Jasso Kumharin.	Kumhari muhalla -	6th February	6th February	Found dead on 6th February 1898.
7	Fakira, Chamar -	Chamar quarter - -	„	„	Found dead on 6th February 1898; disinfecting coolie.
8	Musammat Sarupi, Mahájan.	Muhalla Maliyan -	7th February	8th February	
9	Kewal, Bania - -	Segregation camp -	10th February	11th February	Brother of Mukandi, case No. 5.
10	Jaisukh, Chauhan -	Town - - -	„	10th February	
11	Musammat, Tulsia Chamarin.	Segregation camp -	11th February	12th February	Relative of case No. 7.
12	Musammat Gawali -	„ -	,	15th February	„ „
13	Ralu, Mahájan -	Muhalla Maliyan -	„	14th February	Relative of case No. 8, but not segregated.

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Serial Number.	Name.	Where attacked.	Date of Attack where this could be ascertained, otherwise Date of Discovery.	Date of Death.	Remarks.
			1898.	1898.	
14	Harnam, Banniah -	Segregation camp -	17th February	18th February	Relative of cases Nos. 5 and 9.
15	Musammat Burhia -	„ -	„	„	Relative of case No. 7.
16	Wazira, Banniah -	Maliyan camp - -	„	„	
17	Badri, Mahâjan -	Muhalla Maliyan -	19th February	22nd February	House adjoined evacuated block.
18	Musammat Fahiman	Jawalapur - -	„	20th February	„ „
19	„ Piro -	„ - -	„	—	
20	Ram Sukh - -	Disinfection camp -	20th February	24th February	Disinfection coolie.
21	Musammat Mariam -	Jawalapur - -	„	23rd February	
22	Baij Nath - -	„ - -	21st February	21st February	Found dead on 21st February 1898.
23	Bidhi, Banniah -	„ - -	23rd February	28th February	House bordering on evacuated block.
24	Sarju, Dhobi - -	Evacuation camp -	24th February	26th February	
25	Barhu, Banniah -	- - -	„	24th February	Dead body detected being smuggled out of Jawalapur on 24th February 1898.
26	Kanhaiya, Chamar -	Muhalla Karch - -	25th February	25th February	
27	Buddhu, Banniah -	Jawalapur - -	„	„	House adjoined evacuated block.
28	Chimman, son of Badri.	Segregation camp -	26th February	—	Son of case No. 17.
29	Musammat Gomti, sister-in-law of Buddhu, case No. 24.	Jawalapur - -	„	26th Februray	Relative of case No. 27.
30	Farid Bakhsh, Chaprási.	- - -	27th February	27th February	Found dead in an empty house in evacuated block, Jawalapur, on 27th February 1898.
31	Loti, Sonár - -	Private camp - -	2nd March	—	Boy aged 1½ years was found on 2nd March 1898.
32	Musammat Minnat -	Evacuation camp -	3rd March	3rd March	
33	Kallu, Kahár - -	Jawalapur disinfection gang.	4th March	—	
34	Musammat Ghafuran	Muhalla Pallival -	„	4th March	Aged 10 years.
35	Munshi, Banniah -	Private camp - -	5th March	—	
36	Shankar Lal - -	Jawalapur - -	6th March	7th March	
37	Bishan Sahai -	Jawalapur segregation camp.	7th March	8th March	Grandson of Musammat Gomti, case No. 29.
38	Gungra - -	Camp - - -	„	—	
39	Panchami, Lodha -	Jawalapur - -	„	7th March	
40	Kala, Kumhar -	Jawalapur evacuation camp.	8th March	9th March	
41	Gokul, Banniah -	Jawalapur - -	„	16th March	Taken ill in Meghraj's private camp.
42	Musammat Hardei -	„ - -	9th March	9th March	
43	Mansa - -	Segregation camp -	„	„	Aged 3, daughter of Kala, Kumhar, case No. 40.
44	Mumtaz Ali - -	Private camp - -	„	„	Died in Muhammadan camp, 9th March, after a few hours' illness.
45	Gangadei - -	Segregation camp -	10th March	13th March	Daughter of Musammat Hardei, case No. 42.
46	Bandu - - -	Evacuation camp -	„	10th March	
47	Musammat Bhagwant	Private camp - -	„	11th March	
48	Musammat Joharu, Chamarin.	Muhalla Karch - -	11th Mareh	„	
49	Musammat Ramchandi.	Evacuation camp -	„	„	Daughter of Sarju, Sonár.
50	Mukandi - -	Muhalla Karch - -	12th March	12th March	
51	Chhotan, Jolaha -	„ Chutan -	13th March	13th March	
52	Jagu, Lodha - -	„ Pandha - -	„	„	
53	Bhagi - -	Segregation camp -	14th March	—	Mother of Jagu, Lodha, case No. 52.
54	Parsa - -	- - -	„	—	Kahár of disinfecting gang.
55	Ram Chandar -	Segregation camp -	„	19th March	Son of Hira, chaukidár, and of Gangadei, case No. 45.
56	Sibbi, wife of Ramsukh, Mochi.	Camp Mochian -	„	-	
57	Bhagwana - -	Coolies' camp -	16th March	16th March	Son of Joharu, Mochi, a coolie in disinfecting gang.
58	Musammat Phillo -	Private camp - -	15th March	„	Mother of Jiwan Khan Rao camp Rajput.
59	Mahbub Khan -	Muhalla Jatwara -	17th March	18th March	Constable on plague duty at Jawalapur.
60	Babu, son of Parmanand.	Segregation camp -	„	—	
61	Rama, son of Shadi -	- - -	„	21st March	Working on disinfection work.
62	Badam, Kahár -	Disinfecting gang -	18th March	—	
63	Ramu, son of Nainsukh, Kahár.	- -	„	25th March	Member of disinfection gang.

Serial Number.	Name.	Where attacked.	Date of Attack where this could be ascertained, otherwise Date of Discovery.	Date of Death.	Remarks.
			1898.	1898.	
64	Bhagwana, son of Gulab, sweeper.	Town - -	18th March -	18th March.	
65	Fakira - -	Camp Meghraj -	16th March -	19th March.	
66	Musammat Nasiban -	Camp Rajput - -	20th March -	2nd March -	Mother of Makhua, a disinfection coolie.
67	Musammat Gulabo -	- - -	„ -	—	Mother of Thakur, Khatík, coolies' camp.
68	Gumáni - -	Coolies' camp -	18th March -	25th March -	Son of Shadi, Mochi.
69	Abdul Majid Beg, constable.	Thána (Town) -	20th March -	—	
70	Elahi Bakhsh -	Camp Rajput -	„ -	21st March.	
71	Nathu, son of Maru Jolaha.	Myawála camp -	16th March -	„ -	Disinfection coolie.
72	Parbhu, son of Fakira, Teli.	Teli camp - -	20th March -	„	
73	Maru, son of Baru, Julaha.	Private camp - -	23rd March -	—	
74	Hira, chaukidár -	Segregation camp -	„ -	23rd March -	Related to Hardei, Gangadei, and Ram Chandar, cases Nos. 42, 45, and 55.
75	Pusia - -	- - -	„ -	24th March -	Son of a disinfection coolie.
76	Mitter Sen - -	Government camp -	24th March -	—	
77	Lekh Ram - -	- - -	„ -	—	Disinfection coolie.
78	Mahtabi - -	Camp Chauhan -	26th March -	27th March.	
79	Tara, son of Buddhu, Lodha.	Coolies' camp -	„ -	26th March.	
80	Umadei, daughter of Buddhu, Teli.	Private camp - -	„ -	—	
81	Godha, son of Buddhu, Mochi.	Government camp -	„ -	—	Worked as coolie in the disinfecting gang.
82	Naru - -	- - -	27th March -	27th March -	Worked at the disinfecting gang.
83	Mula - -	Government camp -	„ -	—	A coolie in disinfecting gang.
84	Punni - -	Private camp - -	28th March -	29th March.	
85	Hardwari - -	„ - -	27th March -	29th March.	
86	Gulab - -	Coolies' camp -	24th March -	„ -	Coolie in the disinfecting gang.
87	Sarfaraz Husain, constable.	- - -	28th March -	—	Case concealed by his fellow-constables.
88	Rama - -	Coolies' camp -	„ -	—	Worked as coolie in the disinfecting gang. Nephew of Joharu, who died of plague on 11th March 1898; case No. 48.
89	Kalawati, daughter of Hira.	Segregation camp -	„ -	28th March.	
90	Bhagwan Singh, constable.	Town - -	26th March -	—	
91	Sadiq - -	Private camp -	29th March -	—	
92	Gobind - - -	Coolies' disinfection camp.	28th March -	—	
93	Kashi Ram, son of Raja Ram.	Segregation camp -	3rd April	4th April -	Nephew of Kallu, who had been attacked with plague in Khankhal, and whose family had been segregated in Jawalapur camp.
94	Musammat Radha, sister-in-law of Raja Ram.	„ -	„ -	3rd April -	Related to case No. 88.
95	Raja Ram - -	„ -	2nd April -	2nd April -	Related to case No. 93.
96	Somair, Kahár -	„ -	„ -	3rd April -	He was the elder brother of Ramu, Kahár, who died of plague on 25th March 1898; case No. 63.
97	Nina - -	Coolies' camp -	3rd April -	„	
98	Kedara - -	Teli camp - -	4th April -	4th April.	
99	Megha - -	Private camp - -	30th March -	„	
100	Nanak, Chhipi -	Segregation camp -	31st March -	5th April -	Father of previous case.
101	Chimman, Jolaha -	Private camp - -	6th April -	6th April.	
102	Jaidin - -	„ - -	„ -	„	
103	Musammat Kirpi, Mochin.	Segregation camp	30th March -	5th April -	Daughter-in-law of Godha, Mochi, case No. 81.
104	Uda - -	Coolies' disinfection gang.	7th April -	—	
105	Maru, coolie -	- - -	„ -	—	Member of disinfection gang.
106	Mula, son of Hardwari, Brahman.	Private camp - -	6th April -	10th April.	
107	Binda, cartman -	„ - -	7th April -	9th April -	He used to convey dirt, &c., removed from houses by disinfection men.
108	Bhabuti, sweeper -	- - -	8th April -	8th April -	Member of disinfection gang.
109	Sundar - -	Segregation camp -	9th April -	—	Mother of Umadei, case No. 80.
110	Nathu - -	Coolies' camp - -	8th April -	14th April -	Disinfection coolie.

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Serial Number.	Name.	Where attacked.	Date of Attack where this could be ascertained, otherwise Date of Discovery.	Date of Death.	Remarks.
			1898.	1898.	
111	Gokal, sweeper -	Segregation camp -	13th April -	14th April -	Father of Bhabuti, who died of plague on 9th April 1898, case No. 108.
112	Tarachand - -	Chauhan camp - -	10th April -	—	
113	Radha, Coolie -	Disinfection gang -	27th April -	29th April -	This man was said to have been washing and repairing pukka drains in Jawalapur five days previously.
114	Banwari, Ahir -	- - -	14th May -	—	Formerly employed in removing filth and rubbish thrown out into the streets during the disinfection of houses in Jawalapur.
115	Musammat Marium -	Town -	21st May	—	
116	Edu - -	Segregation camp -	28th May -	—	Related to case No. 115.

If the people had all been put into Government camps I think it is possible there would have been fewer cases in camp. Of course, as they built their own camps they did it as cheaply as they could; they built the huts adjoining one another or very close together. The huts were thickly populated, and there was not much circulation of air. They took out all their goods which were not disinfected, and piled their goods up inside the huts. Not all their property, of course, but a great deal was taken out to the huts.

9179. Had you any control over the sites?—They might have been controlled, but at the time it was not decided as to whether there should be any recognition of this voluntary evacuation or not, or to what extent it should be recognised, and pending orders the people evacuated of their own accord, and having set up their camps it was difficult to interfere with them.

9180. The evacuation did not prove so effective as in other instances?—Not as effective as in Kankhal.

9181. Because the huts were close together and thickly populated, and because the people were allowed to move into the huts articles which had not been disinfected?—I think that is a possible explanation, but, notwithstanding, the disease died out. Of course, as a case occurred in camp, we treated it much as we should a case occurring in the town. The hut was burnt, and the huts actually adjoining it were burnt, and all the people occupying them were moved to the segregation camp.

9182. When did they return?—They returned to Jawalapur during the last three weeks of April.

9183. After they returned, how many cases occurred?—There was Marium (No. 115), who died in the town on the 21st of May. That was the only case that occurred after the re-occupation.

9184. There is the case of Edu (No. 116)?—He was a relation of Marium, and was taken to the segregation camp when Marium was attacked.

9185. He did not die in the town?—No.

9186. Those are the only two cases?—That is so. I cannot remember exactly where Banwari (No. 114) was attacked, but he was engaged in work connected with disinfection. We kept the disinfection coolies in a separate camp long after the rest of the town was occupied, and my records do not show whether this man was in that camp when he was attacked.

9187. Was there any association in Jawalapur between the mortality of rats and plague?—There were rumours of mortality among rats.

9188. Was there any mortality to your knowledge?—Not to my knowledge.

9189. Was there with regard to the other two or three villages?—The natives of Kankhal told me that rats died in large numbers in Jawalapur. The inhabitants of Jawalapur deny it, but we got absolutely no assistance from the people of Jawalapur. All the assistance I got was from the residents of Hardwar and Kankhal, and, therefore, I do not attach much importance to the statement of the people at Jawalapur that there was no mortality among rats there. At any rate, they did not all die; I saw live rats there. At Kankhal it seemed as if every rat had died. In the course of disinfecting and removing the grain I only came across four living rats, and they were musk rats. It seemed as if the rats had been exterminated or had run away. At Jawalapur I did see live rats.

9190. In the other villages where small outbreaks occurred, was any connexion noticed between rat mortality and plague?—No.

9191. How did you effect corpse inspection?—At first I remember a case—I think it was early in January before a case of plague occurred at all—where we had a report from the Assistant Surgeon that a woman had a suspicious attack of fever. I went down with medical officers and said it would be necessary for that woman to be examined. They refused to allow it, and I said I must treat it as a case of plague. I had a special hospital got ready for the family, and said that all inhabitants of the house would have to be segregated for the next 10 days and their property disinfected, whereupon they let us see the woman. This was a living woman, not a corpse, but these means of persuasion were adopted if there was any opposition to corpse inspection. We said: "This has been "reported to us as a doubtful case, and if you will "not allow inspection we must treat it as a case of "plague." That is how we got over it, and the result was, I think, that nearly every corpse was inspected that we wanted to inspect.

9192. Without much opposition?—They did not like it.

9193. But without active resistance?—There was no rioting over any question of corpse inspection. They disliked it, and that may have been one of the causes which led to a small disturbance that occurred, but it was not the immediate cause.

9194. Where did this disturbance occur?—In one of the voluntary camps outside Jawalapur.

9195. Was it important?—It did interfere with our arrangements for a few days; the native officials got very much alarmed, and for two or three days I do not think the reporting was very good. But the actual result of the rioting was not very serious. A few native officers were hit, and two European officers were attacked.

9196. There was no bloodshed?—No.

9197. Then you adopted in all your districts corpse inspection as an alternative?—In this infected area—in this area near Hardwar.

9198. As an alternative to segregation?—Yes.

9199. And the difficulty apparently was not very great?—It was overcome. Corpse inspection is going on now.

9200. Who made these inspections?—They were originally made by the Commissioned Medical Officer in charge of the town. Subsequently, in order to meet the native views, we arranged that on a report of a death having occurred the Assistant Surgeon, accompanied by a native practitioner, or hakim, a private practitioner, should visit the corpse in company. If

they were agreed it was a case of plague it was treated as such; if they were agreed that it was not, it was left alone. If they differed in opinion, then the Commissioned Medical Officer was called in. One of the objections of the people to corpse inspection was that it delayed the disposal of the body, and, in consequence, nobody living in the same muhalla could eat or drink until the body had been removed. We therefore erected two temporary huts near each of the burning ghats and the burying ground, and the corpse was sent there after death as soon as it was ready for removal. We had the examination in those huts. In no case was anybody compelled to keep a corpse for more than six hours. If inspection could not be made within six hours they were allowed to dispose of the body.

9201. You erected a dead house?—Yes.

9202. With regard to female corpses how did you manage? Was there any inspection?—We did not insist upon it to the same extent. If there was any objection to it we treated it as a case of plague.

9203. Did you accomplish the inspection of female corpses in many instances?—Yes, several female corpses were examined.

9204. And by men?—Yes, we had female inspectors, but they were not very trustworthy, and in cases of doubt the corpses were examined by doctors. We first considered the history of the case. We were inspecting most of the cases of sickness in the town, and if there was any accurate record of the woman having been ill for some time beforehand we took it as probable that she might have died from something else than plague; in such cases inspection was not necessary.

9205. You appear to have organised a complete system of registration in the villages. Will you give us some details of what staff you require to carry it out?—Yes. The outbreak having occurred at Jagjitpur, and possibly several cases having occurred before we discovered it, and then a fresh case occurring at Ranimazra, led Government to believe that it was possible that other villages might have been infected in the same way without our observing it, and it was decided to establish a system by which all the villages and all the inhabitants of the villages should come under regular and systematic medical examination. Hardwar is on the boundary of three districts, the Dehra Dun district, the Bijnor district, and the Saharanpur district. I selected an area in each of these three districts which, for various reasons, I thought might become infected. I took into consideration the pilgrim routes, the nature of the towns or villages that were in the area, and finally selected an area of 400 square miles. This was divided up into five divisions: one for Bijnor, one for Dehra Dun, and three for Saharanpur. The Dehra Dun and Bijnor sub-divisions were jungle to a very large extent, with one or two main roads going through them, with villages on each side of them. The Saharanpur divisions were much more thickly populated. In the Saharanpur portion there were three divisions. Each of these divisions was placed in the charge of a European officer. In Saharanpur there were two Civilians and an Assistant Superintendent of Police. In the Dehra Dun district there was a European Deputy Collector, and the Bijnor division was in charge of the Joint Magistrate of Bijnor. I took the whole of this area which I call the area under observation, and in addition to dividing it up into these different divisions, I divided it up into the infected area, which included the Hardwar Union and Jagjitpur, the suspected area, which was more or less in the immediate neighbourhood, and included villages having connexion with Hardwar in some way or another, and beyond that was the outlying area. The Divisional Officer had three or four circles under him; each circle was in the immediate charge of a Naib Tahsildar.

9206. What is a Naib Tahsildar?—He a native official drawing some Rs. 50 a month. We selected not old officials but, as a rule, young men who were candidates for appointments for the higher posts in the executive service, because we thought that agency would probably be the best, as they had more to lose and more to gain than anybody else. In each circle there was a Naib Tahsildar and a Hospital Assistant, and the Divisional Officer also had an extra Hospital Assistant immediately at his disposal. In addition to that there were two Medical Officers between whom I divided up the area of observation outside the infected area. As regards the whole of this area, registers were immediately prepared of the inhabitants in every house in every village in the area.

9207. How long did you take to do that?—I got the telegraphic orders on the 12th, and I collected a staff and got them working by the 19th of January. I was receiving full reports, after the registers had been received, from some divisions by the 26th. The registers were completed throughout the area by the end of the month. Having got those registers prepared in the suspected area, the Naib Tahsildars went from village to village in their circle once in three days. They then called a roll-call of the inhabitants, going from house to house, where they examined the inmates. They were bound to examine all the inhabitants once in eight days. It was not expected, and it was not advisable, that every inhabitant should be bothered and troubled once in three days, but every house was visited once in three days, and any inhabitants who escaped inspection on the first day had to be inspected on the next visit, or at all events once in eight days. In the outlying area the intervals between visits were doubled, because we were less suspicious about that area, and thought such frequent examination was not necessary. In addition, two Medical Officers travelled about from village to village and did a great deal of inspection on their own account, and specially examined and inquired into any case specially reported to them by the Divisional Officers as suspicious. The European Officers supervised the working of the subordinates and checked their inspections; they received daily reports of work done, cases of sickness found, and deaths that occurred, of which they made an abstract for submission to me every day. I entered these in registers which I kept for the purpose. I had thus a full and accurate record of all sickness and of every death.

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9208. In these returns were the inhabitants who were not in good health entered?—Every case of sickness was reported, and anybody who was sick at one inspection was seen again on the next inspection.

9209. You thought that system satisfactory for obtaining early information?—Very; originally the orders were that no action was to be taken by the Naib Tahsildar himself or even by the Divisional Officer: they had to refer the matter to the Medical Officer in charge of their division, who would again send a report to the chief Medical Officer in the infected area, where we had the only officers who had had experience of plague at that time. If it were thought necessary by the Medical Officer in charge, a special officer was deputed from the infected area to visit and inspect the case. When pneumonic cases were occurring, we got reports from the native Hospital Assistants which I did not consider altogether satisfactory, and then I prescribed registers which would show at a glance whether any relation of a person who had died had died within a month, and whether anybody living in the same house or the same compound or in a compound within 50 yards, had been either attacked with any sickness or had died. I thought that those registers would attract attention to any outbreak in epidemic form. There was a small outbreak at Dhanpura, which was found out entirely from those registers. I felt suspicious owing to the occurrence of three deaths in houses close together, and sent down a man to take specimens, when it was found that the case had died of plague, although there had been no external symptoms.

9210. With regard to the whole district, was there any inoculation?—There was no inoculation at all.

9211. Why?—At Jawalapur arrangements were made for inoculations, but we were to use no pressure on the people, and they would not hear of it.

9212. (*Mr. Hewett.*) Please describe the situation of Hardwar?—Hardwar is situated at the north-east corner of the Saharanpur district, where the Ganges makes its way through the Siwaliks into the plains, and is confined between the hills and the river. About half a mile below Hardwar is the head of the Ganges Canal, and situated in the fork between the Ganges and the Canal with the town of Kankhal, Jawalapur being on the other side of the Canal three miles below Hardwar, and about one mile from Kankhal.*

9213. The surroundings of the place are rather favourable to the measures which were taken?—The situation of Hardwar and Kankhal would be very favourable to a system of cordon.

9414. The outbreak in Hardwar was very mild?—Yes.

9215. Is it the case that after the muhalla had been evacuated, no case occurred either among the people

* *See* Appendix No. XXIX. in this Volume.

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in camp or among certain caretakers who were left behind?—That is so.

9216. Does not that look as if the infection was very mild?—The houses in which the caretakers were left were disinfected immediately after the people were turned out of the muhalla; that might account for the caretakers not being infected.

9217. I suppose the caretakers are very few?—I think in Hardwar we left about 30. There were a good number of temples where certain ceremonies had to be performed, and in these we left priests. We arranged originally to leave caretakers in the more important of the evacuated houses, as in Hardwar we had done so with success, none of the caretakers so left having been attacked, but this was probably due to the outbreak there having been less virulent than those elsewhere. In Kankhal the proportion attacked was larger. In all we did not probably leave more than 70 or 80 persons in the town. One of the earlier cases in Kankhal was that of a little girl, who ultimately recovered. She and her father with a servant were segregated in a house in the town. Almost at the end of the outbreak, and after the girl had recovered, her father was attacked. The second area evacuated in Kankhal contained the house of one of the leading men of the town. The house was well built and ventilated, and kept scrupulously clean. For various reasons we made an exception in favour of this man, and allowed him and his family to remain in their house. Two members of the family were attacked, although all the surrounding houses had been evacuated. A man was attacked with plague in a house in which a woman was about to be confined. The family of nine persons were segregated in their own house, the surrounding houses being evacuated; five members of the family were attacked. In another block that was evacuated there was a house in which a woman, owing to recent confinement, could not be moved. She with two attendants were left in the house. Her sister was attacked within a week of the evacuation. An old man and his sister were left in an evacuated area to look after a temple. The sister was attacked with plague two months after the surrounding houses had been evacuated, and after the whole town had been evacuated. After the outbreak had, to all appearances ceased, four cases occurred in a family living in a collection of huts separated from the town, which for this reason had not been evacuated. Two chaukidars on duty in evacuated areas were attacked. The above cases all occurred in Kankhal; elsewhere we left practically no caretakers, but both at Jagjitpur and Jawalapur several constables and chaukidars on duty in the evacuated infected areas were attacked. Large numbers of men employed in disinfecting evacuated houses were attacked, these attacks occurring for some time after the town or village had been evacuated.

9218. The evacuation in Kankhal took place, I understand, one block at a time, because you found your circle of infection extended?—We had to take blocks from different areas of the town of Kankhal; we did not take adjoining blocks in all cases.

9219. You speak of the possibility of Kishan Ram having been removed from the house where he died to another house; was that practice common?—I remember a case in Jawalapur, in a muhalla which was evacuated; we found the dead body of a man there, and I think there is very little doubt that he was taken there from some inhabited house.

9220. The practice has been common elsewhere; do you think it was common here?—No: but as soon as a case of plague occurred, the inhabitants of the house, or of the neighbouring houses, removed to other houses. I do not think it was possible that many dead bodies were removed from one house to another. At Jawalapur, there was another case, in which they were taking a body out of the town, but we discovered that, as I think we should have discovered similar removals if there had been any.

9221. How many cases were there before total evacuation in Kankhal, and how many cases afterwards?—38 cases occurred in the town, of which eight occurred either in isolated houses which had not been evacuated, or were of persons permitted to remain in evacuated houses; nine occurred in the segregation camps; eight occurred in the evacuation camps shortly after the people had left the town; two chaukidars on duty in the evacuated area were attacked; and four persons connected with the work of disinfection were attacked.

9222. The people in Kankhal did not get back till about the 15th of February?—That is so.

9223. Under ordinary circumstances, you would have sent them back some considerable time earlier?—Yes, early in December.

9224. There was a special reason why you did not send them back then, was there not?—When it was decided to allow the people to return to Kankhal, in order to be extra safe it was ordered that all houses in which a case of plague had occurred should be again disinfected. In making one of those secondary disinfections the owner of the house as soon as the house was opened, pointed to a hole in the wall, and said, "there has been a thief here." The hole in the wall led into a small inner room of the house in which there was no window. When the wall was pulled down, we found the room was full of property which had escaped disinfection. It was a small inner room, and the door was built up and white-washed, and perhaps furniture put in front of it, and it was impossible to tell there was any door there. This led to further inquiries being made, and, in all, 39 such blocked-up rooms were discovered. In many cases it was extremely difficult to find the rooms; you could not see them by simply going into the house, and the officers had to measure the roofs, and then measure the inside of the house, to see whether the whole area was accounted for. In all cases where such rooms were discovered, the whole house was thoroughly re-disinfected.

9225. The disease was stamped out in November. Would you naturally expect it to become more virulent at that time?—Yes. There were several deaths from plague among the small number of people allowed to remain in the town, which suggests that but for evacuation the total mortality would have been far greater than it was. There were very few cases in the camps, and these occurred, with one exception, within three or four days after the camps had been formed. These persons were probably infected before they came into camp. The disease had not spread in the camp. The general health of the people in the camps was excellent. A number of people went out there sick, and in a short time recovered their health entirely.

9226. Was there any recrudescence?—There was no recrudescence in Kankhal, but there were two cases imported from Jawalapur. We got a report when these cases occurred, and made inquiries, and found that the people concerned owned houses in Jawalapur, that within three or four days before they were attacked those houses in Jawalapur had been disinfected, and that, in accordance with the usual custom, a member of the family had been to Jawalapur to be present during the inspection. He was attacked within three or four days of his return. Those were evacuated houses which were disinfected, and not houses in which cases of plague had occurred. Immediately steps were taken to segregate the people. The people of Kankhal themselves were very anxious that there should be no case of plague, and they gave us information. The house was again disinfected, and the disease did not spread to the other houses adjoining.

9227. Will you give us the same figures about Jawalapur as about Kankhal, showing the total number of attacks before evacuation and after total evacuation?—I think I have given you those.

9228. I understand you to say that 30 cases occurred in the town; does that mean before evacuation?—Yes. The list shows 116 cases in all. Thirty-one cases occurred in the town, 30 in the evacuation camps, 25 in the segregation or contact camps, and 29 cases were of persons connected more or less with the work of disinfection. Those 29 cases I have kept separate, and they are not included in the 31 in the town, or the 30 in the evacuated camps. 15 of these were attacked in the special coolie camp we had. When we first had plague cases occurring among the disinfection coolies we estabished a camp, and endeavoured to arrange that everybody engaged on the work of disinfection should reside in those camps, but we found it almost impossible to carry this out.

9229. Can you give us the strength of the establishments you had—first, medical; secondly, administrative; thirdly, police—first of all in Hardwar, secondly in Kankhal, thirdly in Jawalapur, and fourthly in these villages?—Do you want sweepers?

9230. No, only the administrative, medical, and police establishments; I excluded the conservancy

establishment purposely?—I will work out the statements you require. (The following statements were subsequently supplied:—

STATEMENT showing the NUMBER and PAY of SPECIAL ESTABLISHMENT (Medical) employed at HARDWAR on 1st JUNE and 1st NOVEMBER, 1897, and 1st APRIL 1898.

Rank of officials.	Number of officials employed.	Rate of pay of each.	Remarks.
On 1st June, 1897.			
Assistant Surgeons	3	Rs. 100	Allowance per day. Rs. 2
Hospital Assistants	1	„ 60	Allowance per day. Rs. 8
Do. -	1	„ 55	Do. do.
Do. -	3	„ 25	Do. do.
On 1st November, 1897.			
Assistant Surgeons	5	Rs. 100	Allowance per day. Rs. 2
Hospital Assistants	4	„ 35	Allowance per day. Rs. 2
Do. -	14	„ 25	Do. do.
Do. -	1	„ 20	Do. do.
Dhai - -	2	„ 20	—
Compounders -	2	„ 15	Allowance a day. 2 annas
Do. -	1	„ 10	—
Vaccinators -	9	„ 10	Allowance p.m. Rs. 4
Do. -	2	„ 8	Do. do.
On 1st April, 1898.			
Assistant Surgeons	5	Rs. 100	Allowance per day. Rs. 2
Hospital Assistants	5	„ 35	Allowance per day. 8 annas
Do. -	1	„ 30	Do. do.
Do. -	26	„ 25	Do. do.
Do.	3	„ 20	Do. do.
Native Doctors -	4	„ 25	Do. do.
Do. -	4	„ 20	Do. do.
Clerk - -	1	„ 15	—
Compounders -	2	„ 15	—
Do. -	1	„ 10	—
Vaccinators -	10	„ 10	Allowance p.m. Rs. 4
Do. -	7	„ 8	Do. do.
Dhais - -	23	„ 20	—
Do. - -	1	„ 15	—
Do. - -	1	„ 10	—

STATEMENT shewing the NUMBER and PAY of POLICE on PLAGUE DUTY at HARDWAR.

Date.	European Inspector at Rs. 200.	Native Inspector at Rs. 200.	Sub-Inspector at Rs. 30.	Head Constable at Rs. 15.	Constable at Rs. 7.	Dafadars at Rs. 30.	Mounted Constable at Rs. 22 and Rs. 25.	Village Chakadaras at Rs. 2 13 a.	Pay. R. A. P.
1st June 1897 -	—	—	1	8	22	—	—	105	599 5 0
1st November, 1897.	1	—		16	100	1	14	100	1873 4 0
1st April, 1898 -	1	1	7	42	276	1	14	106	3832 2 0

JAWALAPUR OUTBREAK.

Establishment on 1st April, 1898.

In infected area.

Civil.

Assistant Collector -	1
Tahsildars - -	3
Naib Tahsidars -	18 at Rs. 50 each.
Kanungos - -	12 at Rs. 30. each + Rs. 20 p.c. allowances.
Patwaris -	10 at Rs. 15 each.
Sub circle officers -	2 at Rs. 10 each.

KANKHAL OUTBREAK.

Establishment on 1st November, 1897.

Civil.

Assistant Collector -	1 at Rs. 700 p m.
Tahsildar -	1 at Rs. 150 p.m.
Naib Tahsildars -	3 at Rs. 40 p.m. each.
Patwaris - -	5 (3 at Rs. 10 and 2 at Rs 9. p.m.)
Darogha Safai -	1 at Rs. 15 p.m.
Muharrir - -	1 at Rs. 10 p.m.

JAWALAPUR OUTBREAK.

Establishment on 1st April, 1898.

In area under observation in the Dehra, Bijnor, and Saharanpur Districts.

Civil.

Assistant Collectors -	2
Assistant District Superintendent of Police -	1
Deputy Collector -	1
Naib Tahsildars -	14 at Rs. 50 each.

General Establishment.

English clerk -	1 at Rs. 40 p.m.
„ copyist -	1 at Rs. 12 p.m.)

9231. Turning to the original organisation for detecting cases, I see that you had five Europeans employed on it. What was the size of the population it had to deal with?—200,000 people.

9232. In your own district there would be three Sub-divisional Officers, and about 12 Naib Tahsildars?—Yes. I will give you the exact figures for those.

9233. Would that not be a very expensive establishment if it were extended so as to cover the whole of your district?—Yes.

9234. Do you regard it as feasible to employ such an organization, except in the case of a great emergency, such as an outbreak of plague?—I think it would be useless to do it unless you know plague is in the neighbourhood, and want to ascertain whether it is extending.

9235. You consider it to be necessary only in cases of emergency?—Yes, it is only then that I should recommend it.

9236. Did you have any experience of corpse inspection, with the Muhammadans?—Yes.

9237. Were there many Muhammadans?—There are not very many there altogether, but the bodies of the Muhammadans were all inspected.

9238. Did they resent it more than the Hindus?—I do not think so.

9239. If you did not examine all female bodies, what is the use of corpse inspection?—It is a decided advantage to get the cases of all males dying. We also get a very large number of females, if not all. The number of females not examined was very small.

9240. You cannot ascertain whether a person has died of pneumonic plague by corpse inspection?—That is so.

9241. That is a defect?—Yes.

9242. May it not be a very serious defect?—If you have many pneumonic cases occurring, yes, but if the inspection showed no outward signs of plague further inquiries would be made. We first of all see if it is a case of bubonic plague: if it is we take action at once. If we find it is not then we have to make further inquiries. We trace the history of the case as accurately as possible, and if it is ascertained that the deceased had been in contact with plague, or his symptoms or the course of his illness are suspicious, we should treat it as a case of plague, and probably take specimens for microscopical examination.

9243. Did you find it harder to work a corpse inspection in Jawalapur than in Hardwar and Kankhal?—Everything was easier in Hardwar and Kankhal than in Jawalapur.

9244. Can you tell us why?—Because the leaders of the place helped us very little there. At Hardwar and Kankhal it was almost unnecessary for us personally to use pressure of any kind except in a few instances. If the people objected to do anything I had simply to ask the leading men to go and make them do it.

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9245. Was that because the leaders of the people in Hardwar and Kankhal were extremely interested from a pecuniary point of view in keeping the place free from plague?—Probably the people in Jawalapur were more interested. The Pandas live entirely on what they receive from the pilgrims who come to Hardwar.

9246. Why did not they help you in Jawalapur?—Because the class of people there is very different. Their leaders, such as there were, were not intelligent, and did not realise that what we were doing was any good, and they had no influence over the people, whose only idea was to stop operations at once at all costs. The people at Kankhal on the other hand understood it was better to stamp out the disease.

9247. Do you think, supposing you had an outbreak of plague in one of the big cities of Northern India, say Agra, that corpse inspection would be resented or not?—It would want great tact. It could be done to a certain extent. If plague breaks out in a very large town it would be most important to have corpse inspection at the beginning of the outbreak in order to ascertain if plague is spreading or not and to detect each of the earlier cases, to enable measures being in all cases taken to stamp out the disease if possible. But if plague spreads all over the town, there would be no necessity for insisting on corpse inspection. Corpse inspecting at the beginning of an outbreak could be arranged if you can get the native leaders on your side.

9248. Might they not be more likely to resent it at the earlier stages?—I do not think so: I think they would object more later on than they would at first. I am talking of the first few isolated cases at the beginning. There would be many interested in stamping out the disease and they would overcome the objections of the few immediately concerned. I do not think it would be possible to carry out corpse inspection in a large town in which plague had broken out in epidemic form nor would it be necessary.

9249. Supposing the people were not sure that plague did exist?—You have had one case of plague, and you are alarmed, and you are anxious to find out whether there are any cases in the immediate neighbourhood, in such a case corpse inspection would be necessary and could be effected.

9250. It is at the outbreak that it is most valuable?—Yes.

9251. You do not think it would be more difficult at the outset?—It would be more difficult, probably, in a large town than at Hardwar and Kankhal, but I think it is feasible.

9252. (*Dr. Ruffer.*) You said that in Kankhal you made some inquiries in September, and that six people had probably died of plague in August?—In August and September.

9253. I suppose it was difficult to get accurate information in September as to what had occurred in June and July?—Yes, but the number of deaths was very small, it was so small that one could inquire into the circumstances of each case. I traced suspicious cases back to the 3rd of August but before that I have no reason to suspect there were any. None of the deaths before that date were connected with any of the deaths which occurred later on they were not related to the people who died later on. They were mainly old people or young people who would die in the ordinary course, whereas these special cases were closely connected, and they died after a very short illness. In one of them the Hospital Assistant or the Assistant-Surgeon reported that a child had died of mumps. A person does not often die of mumps, and the probability was it was a case of plague. In another case a man had a bubo and had had leeches applied to him.

9254. Suppose some of these cases were cases of pneumonia do you think you could have traced them from the register?—You might trace them if they were connected. You would be suspicious if they were connected with other deaths occurring about the same time and in or near the same house: but we had no cases of pneumonia plague at that time of the year.

9255. Were you able to trace infection from other villages in these six cases?—No; every one of them occurred in the neighbourhood closely adjoining the house in which Kishan Ram died.

9256. I think you said that the people, in order to escape disinfection, occasionally sent the clothes away?—Yes: the people removed their clothing from the houses in which cases had occurred, or from adjoining houses, to other parts of the town at Kankhal, with the result that fresh cases sprung up in different parts of the town, whereas at Jawalapur where our measures made it less easy to so remove the clothes, the fresh cases occurred on or near the boundary of evacuated blocks.

9257. Do you think there was any possibility of hiding cases in the camps? Do you think you know what was the real mortality in the camp?—I think that possibly for two or three days after the riot took place some cases may have occurred and were concealed, otherwise cases were not concealed in the camp.

9258. Was there a roll-call in all the camps?—There was a roll-call in all the camps, soon after they were erected.

9259. Supposing there was a case of plague in the Government camp would it have been the relations' interest to conceal it?—Yes.

9260. Might they not have destroyed the body by burning?—I do not think so. They would have to remove it.

9261. Might they not have burnt it in the camp?—No; we had police guards in every camp; every road was patrolled. They could not get to the regular burning ghats, and the Hindus would like to take the corpses there. They could not get there without passing over a bridge. I do not think any cases were concealed in the camps except possibly during those few days in April.

9262. You are satisfied that you know the real mortality?—Yes, we certainly know it in the contact camps.

9263. Were the people disinfected before going into camp?—At Kankhal, originally, we did not disinfect them before going into camp. Later on we did so, especially at Jagjitpur. At Jawalapur those moving out into the Government camps, that is, where there was compulsory evacuation from an infected area, were all disinfected, but in the case of voluntary evacuation this was not possible.

9264. Did the epidemic in one case last for some time after the people had gone into camp?—Yes.

9265. Might not this have been due to the absence of disinfection?—That is possible.

9266. Did you find the Musalmans had more objection to corpse inspection than people of other religions?—They had in the case of women, but I do not think there was any great objection to corpse inspection in Hardwar and Jawalapur, from my experience there.

9267. Do you think they would object more strongly than the others?—We had only cases among the lower classes. The Muhammadan population in Jawalapur is very small. They are Muhammadan Rajputs, and they behaved very well; the leaders insisted on our being allowed to see the bodies.

9268. There is no place where corpse inspection is compulsory?—There is none except at Hardwar.

9269. (*Mr. Cumine.*) You say, I observe, in your printed précis of evidence that it was noticeable that more cases of plague occurred in pukka houses than in the mud huts, and no cases are known to have occurred in the butchers' quarter, which was not evacuated, though their houses were all disinfected?—That is so. I have not the exact figures, but it was noticed that the earlier cases at Jawalapur were in the large well-built Hindu houses. The Muhammadans mostly lived in the kutcha portion of the town.

9270. In the infected towns and villages is there any caste the members of which are entitled to get the clothes of dead bodies?—Yes.

9271. Did you find that they got plague much?—There is a caste of Brahmans known as the Acharj, and it was noticeable at the commencement of the outbreak in Kankhal that a considerable number of people belonging to that caste were attacked. Later on in order to make arrangements for the funeral ceremonies and to obviate the danger of the disease spreading through the Acharjs, we appointed one special Acharj to carry on all the funeral ceremonies and kept him more or less under observation the whole time. We only allowed new clothes or articles to be given as presents on the occasion of funerals. With regard to the villages, we had no epidemic except at Jamalpur and Jagjitpur, and the Acharjs did not get clothes there, and were not attacked there; we burnt all the clothes at once.

9272. In Hardwar there was partial evacuation and I was successful; that was during the hot weather?—Yes.

9273. But as regards the other two towns, the experience would appear to be, would it not, that in the cold weather, when once plague has fastened itself on a place, partial evacuation does not stop the disease?—Probably not, after it has fastened on a place.

9274. I suppose it reduces the number of people attacked, does it not, by, as it were, withdrawing some of the fuel from the burning area?—Yes.

9275. Does your experience point to the *site* being infected?—Yes, to the source of infection being more or less local and being connected with the site. Moving the people to a fresh area seems to stop the disease.

9276. Does your experience seem to show that after the village site or town site has been evacuated the disease moves on in some unknown way and spreads itself all over the site even after human beings have abandoned it?—I have a map* of Jawalapur which will show how the cases occurred. In Jawalapur it is noticeable that a large proportion of the cases occurred actually on the boundary of an evacuated block. The plan shows the sites of the houses in which the first 12 cases of plague occurred in the town itself as distinguished from those which occurred in the camps. Although some of the cases subsequent to the 12th occurred in houses situated on the boundaries of evacuated areas, no inferences can be drawn from them, as cases were then occurring in various other parts of the town, in the camps, and among the members of the disinfection staff. I would first repeat that it may be taken as practically certain that from the beginning of the outbreak till a period subsequent to the occurrence of the 12th case every fatal case that occurred is known, and it is almost as certain that there were no other cases, *i.e.* non-fatal cases, which did not come to light. I must also repeat that an area surrounding the house attacked was evacuated as a rule on the day the case was discovered. The following list gives the dates on which each of the first 12 cases occurred, and the position on the plan of the houses in which they occurred:—

Serial No.	Name.	Date.	Reference to plan.
1	Gokal	9 Jan.	R. 17.
2	Mukandi	2 Feb.	R. 17.
3	Musammat Jasso	6 Feb.	X. 20.
4	Fakira	6 Feb.	Y. 2.
5	Sarupi	7 Feb.	O. 14.
6	Jaisukh	10 Feb.	L. 11.
7	Raju	11 Feb.	O. 13.
8	Badri	19 Feb.	P. 17.
9	Musammat Fahiman	19 Feb.	T. 16.
10	„ Piru	19 Feb.	Q. 14.
11	Baijnath	21 Feb.	M. 13.
12	Bidhi	23 Feb.	Q. 19.

From these 12 cases I would eliminate No. 4 (Y. 2), the case of a coolie employed on disinfection work, and living in the Chamars' quarter which is quite detached from the town, and who almost certainly caught the infection whilst engaged on disinfection duty. Cases No. 5. (O 14) and 7 (O 13) may also be considered as one case, or rather as originating from one focus. They were near relatives, lived in houses almost adjoining, and though the block round the house of No. 5 was put in quarantine (*i.e.* a cordon was placed round it and egress prohibited), it could not owing to heavy rain be evacuated till after case No. 7. occurred. We have therefore to take into consideration the original and 9 subsequent cases. The first case (R. 17) occurred on the 9th of January. An area surrounding it was evacuated and there was no suspicion of another case till the 2nd February, when case No. 2 (R. 17) occurred in a house on the boundary of the block that had been evacuated on the occurrence of case No 1. There had been an interval of 24 days. Case No. 2 had had no connection with case No. 1, and it is almost impossible that he could have contracted the infection before block No. 1 was evacuated. Case No. 3 (X. 20) was that of a Kumharin woman—her house, though in the neighbourhood of the first two cases, was separated from them by inhabited houses. Omitting case No. 4 for reasons given above, we come to the three cases 5 (O 14) 6 (L. 11) and 7 (O 13), all of them, somewhat separated from previously evacuated areas. Case No. 8 (P. 17) occurred on the boundary of evacuated block No. 2, 17 days after the occurrence of the case No. 2 and the evacuation of the block. Case No. 9 (T. 16) occurred on the boundary of the evacuated blocks No. 1 and No. 2. Case No. 10 (Q. 14) occurred on the boundary of block No. 5, 12 days after the occurrence of case No. 5 and 8 days after the block had been evacuated. Case No. 11 was in a house 60 or 70 yards from the boundary of block No. 5. Case No. 12 was situated on the boundary of block No. 2, and occurred 21 days after that block was evacuated. Out of the 9 cases, therefore, 5 occurred in houses on the boundaries of previously infected, but evacuated, areas, and separated from infected houses by several empty houses, presumably uninfected. The 4 cases which did not occur in houses on the boundaries of evacuated areas were none of them at more than some 200 yards distant from a previously infected house, and at the time no other parts of the town were infected. The 12 cases contain people of different castes, and who, even of the same caste, were unconnected.

* *See* Appendix No. XXX in this Volume.

9277. (*Prof. Wright.*) How many yards was Mukandi's house from Gokal's?—That would be about some 70 or 80 yards. Sarupi's case occurred during the very heavy rain, and it was impossible to completely evacuate at once. Raju was attacked not very far from Sarupi's, before the evacuation was completed. Bidhi's house was on the boundary of the evacuated block in which Mukandi died. Mukandi died on the 2nd, and Bidhi's case occurred in the house on the boundary on the 19th. The house of Fahiman joined the evacuated block in which Gokal was attacked.

9278. Can you let us know the general impression which was made on your mind with regard to the question as to whether the plague does spread out centrifugally in a series of concentric circles from the original focus of infection?—My impression was that it was very noticeable that a very large proportion of these cases did occur on the boundary of an evacuated block, generally after a period varying from a week to 12 days. I think it has been asked as to whether the people living on the boundary had access to the evacuated area or the infected houses. I will not be positive, but this was most unlikely, we had a strong force of police posted round the evacuated area; there were two constables at every corner, and if those men did their duty it was impossible for any of these men to get inside. Occasionally I have met a man walking inside. Of course, one difficulty was that we had disinfection coolies, and occasionally a man might have got in with them, but it was unlikely and certainly I did not come across many.

9279. (*Mr. Cumine.*) With regard to disinfection. After you disinfected with perchloride of mercury, did you have the house whitewashed?—Not at the time.

9280. You did not have cases of whitewashers being attacked—the people who went to whitewash disinfected houses?—No. I may tell you that at Kankhal the whole of the whitewashing was done by the people themselves. On the 15th February the town was declared open, but it had not been whitewashed, and the people were told that that would not get a pass to occupy their houses until they had whitewashed them. None of those people were attacked.

9281. A very important point in evacuation is to get it done at once, is it not?—Yes.

9282. If you prepare a camp for everybody, and disinfect the clothes of everybody before letting them into the camp, that would take a considerable time, would it not?—Yes.

9283. If you turn them all out immediately and leave the unsuspected people to make their own huts, they may not put up their huts so regularly and so far apart as they ought. But will not this disadvantage be outweighed by the advantage of having got them all out immediately?—It is an advantage to get them out very quickly; that counteracts the other. You may got a few more cases, but possibly if you had to leave them in the town longer you would have a still greater number of cases.

9284. If you leave them to settle down as they choose they will settle in clusters will they not; but although the huts in one cluster may be closer together than you would like, still there is generally a considerable distance between the clusters, is there not?

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—Unfortunately the clusters are apt to be very large. Different sets of people build their camps a mile or two miles apart, on different sides of the town; but we had private camps in which there were probably 1,500 people living, whereas we kept our Government camps to much smaller dimensions.

9285. Did you try selecting one or two leading natives in each cluster and making them responsible for the reporting of all cases of sickness in that cluster?—At Jawalapur that was impossible. I received practically no assistance there.

9286. I mean in any of the smaller villages?—No; we had our staff there and relied upon them. We had assistance from the Headmen but did not rely on them. In Kankhal, in the town, a large number of cases were brought to our notice by a native, a Hakim. After they were out in camp we always had a strong establishment in the camp and a case was discovered as soon as it occurred.

9287. Did you find that the people in a cluster used ever of their own accord to isolate any one that was attacked in that cluster? When you went out in the morning did you find that so-and-so had been attacked by plague and that the people themselves had put him in a hut 50 yards off from the cluster?—No, we discovered the cases too quickly for that; they had not time. If a man was attacked during the night it was known when our roll-call took place early in the morning; we had the observation huts outside the camp and the man was removed there at once. In the villages it was different. I found, on one occasion, that a man had left Jawalapur with his son who was ill and went to take refuge in a village, but was not allowed there and he had to put up in a hut some distance from the village, where the son died. This man himself then went to another village and tried to get accommodation there but it was refused. He returned to Jawalapur and was attacked with plague the next day himself. Throughout the area we had under observation the villages would not allow a sick person to enter their village, and as far as possible they excluded all strangers.

9288. (*Prof. Wright.*) In connection with your map showing the centrifugal spread of plague from a focus independently of men and rats could you give us the dates on which the various cases were attacked? Further, were the dates you have just given us the dates on which the cases were discovered?—Yes.

9289. Can we get any information as to date of the attacks, since obviously the nearer cases might, though discovered earlier, have been attacked later than the further out-lying cases?—That would be impossible. Gokal's case occurred on the 9th January, and the next case, Mukandi occurred on the 2nd of February. You will find, as a rule, that several days elapsed before the case on the boundary occurred. These are not the dates when they were discovered, because we were able to find out when they became ill, and that date would find its way into the list.

9290. What in your opinion is the true genealogy of the plague in Kankhal? I understand that Kishan Ram went to Kankhal in May, and rats were discovered dying there in June?—Yes.

9291. Do you know at what date the rats first began to die?—We heard of the mortality about the middle of June, and they told me it had been going on for three weeks, and they were dying after that, but for how long after I cannot say. The mortality had ceased to be noticeable by the end of June.

9292. Then in July there was no mortality in either rats or men?—No, and then in the beginning of August there were suspicious cases.

9293. There was a whole month, during which in your opinion plague lay latent in Kankhal?—Yes.

9294. You say these people went out into camp from Kankhal without any disinfection of their clothes?—Yes.

9295. And there were no cases of plague in camp except during the first few days?—I think there was one case which occurred on the 9th or 10th day, after the man went into camp. That was the longest period; the other cases occurred, as a rule, on the second or third day.

9296. Would it be safe to infer from that fact that the plague virus in clothes is killed off very soon in the open air and in huts?—Yes that seems to follow, but the Kankhal people did not take out much property with them; I refused to allow any great number of bundles; I had not the carriage for them.

9297. Can you deduce from your observation in Jawalapur that articles taken out of an infected district become free from infection after a certain time?—Yes, large quantities of property was taken into the private camps at Jawalapur. None of this was disinfected. A certain number of cases occurred in camps, at intervals, the infection probably being taken out in the clothes, but after the end of April there were no more cases and the clothing if originally infected had ceased to be dangerous. After the end of April there was no case there: therefore it died out although the clothing was not disinfected.

(Witness withdrew.)

R. B. Lala Gobindjas

RAI BAHADUR LALA GOBINDJAS called and examined.

(Evidence translated by Secretary.)

9298. (*Dr. Ruffer.*) Do you remember the case of Dr. Lachhmi Chand, Canal Hospital Assistant?—Yes; Lachhmi Chand was not ill; his sister, daughter, and father were ill.

9299. Lachhmi Chand himself had been in contact with plague patients, had he not?—Yes, he treated them.

9300. And is he not supposed to have caused infection to his family without having been ill himself?—Yes.

9301. Were his family, father, sister, and daughter isolated?—After the sister and the daughter died the rest were segregated.

9302. There was plague in the town at that time; might they not have been in communication with another case of plague?—They were not so segregated that they could not have been in contact with other cases.

9303. Have you had any experience of the various arrangements in the Government camps?—Yes.

9304. How did you feed the poor and incapacited persons in the camps?—They got carriage from the places where they were segregated to the camps, and food from the Government. Others who were able to support themselves did so.

9305. What did you do with them in the winter?—In the winter poor people got razais, and wood was given to them. People who could afford it had to get their own.

9306. Was compensation given for things destroyed by fire?—Compensation was given to them according to the decision of a number of inhabitants of the place.

9307. On the whole, were the people satisfied with the arrangements in camp?—The people on going to the camps soon recovered their health, and they went willingly; I went myself. I speak of all the camps. In certain muhallas in which plague had not broken out people of their own accord asked the Collector to let them go into camps.

9308. Was there any provision made for their religious ceremonies?—One or two priests were left in the temples in order to carry on the religious services.

9309. Were the people allowed to bathe in the Ganges?—No interference was made in this matter. The people were allowed to go down to the Ganges and bathe when they wanted to. The Collector, Mr. Winter, and the Joint Magistrate went round to ask the people if they had any difficulty or trouble at all, and if anybody made a complaint the matter was put right at once.

(Witness withdrew.)

MAHANT KAHN DAS, called and examined. *Mahant Kahn Das.*

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(Evidence translated by Secretary.)

9310. (*Mr. Hewett.*) How were the houses disinfected at Hardwar?—The doctor and coolies, water-carriers, and others, went first of all to the house. The house was completely evacuated and the goods taken out of it, and it was then washed over with liquid by means of a syringe. The goods outside were divided by the doctor into three categories: firstly, goods which were to be burnt; secondly, goods which were to be disinfected in hot water; and thirdly, goods which were to be disinfected by a solution applied to them with a syringe.

9311. What was done with the silk goods?—The silk and Cashmere goods were disinfected by being laid out in the sun.

9312. What compensation was paid for any damage?—Old rotten clothes and other articles and chattels deemed fit to be burnt were entered in a list, and their prices were fixed by Mahant Jhandugir, Lala Ram Prashad, and myself, and the money due for them was paid afterwards.

9313. What was done with the mud floors of houses?—They were dug up.

9314. How long were those people who were not sent to camp kept out of their houses while disinfection was going on?—When the epidemic began, even before camps were started, the people themselves left the town.

9315. Did not a certain number remain in the town?—In the muhallas and quarters in which the epidemic was raging no one remained; but in other portions of the town people did remain.

9316. In the quarter of the town in which there was no plague were the houses disinfected?—Yes.

9317. How long were the people in those uninfected muhallas kept out of their houses while disinfection was going on?—A few hours only; just sufficient time to disinfect the houses and look after the clothes.

9318. Did they object to this?—No, nobody objected. In Hardwar there were not many people actually living in the town.

9319. Did about 500 people remain there?—Not so many.

9320. In the case of houses which had to be disinfected in the absence of their owners, what precautions were taken to prevent articles from being lost?—The house, which was locked up by the owner, was opened in the presence of the Police and the Government officials, and in the presence of these officials the house was disinfected, and the goods taken out and dealt with properly. That portion which was to be burnt was burnt, and compensation was assessed upon it. The other goods were returned after disinfection, and the house was locked up again, and the key given to the Joint Magistrate.

9321. Was there ever any complaint of articles being lost after disinfection?—There was no complaint in Hardwar.

9322. Did you see this yourself?—I was myself present and there were no complaints. I should have heard if there had been any.

9323. Will you describe what was done during the fair in April 1898 to keep people who came from the infected area under observation?—Huts were put up in Ghoramandi. When the trains came in, I, with the Assistant Surgeon and Police officials, went to meet them. We identified those who came from plague districts by their faces, language, and tickets, and by generally questioning them. Those who had come from such districts were segregated and sent to the Ghoramandi camp.

9324. When they got to the Ghoramandi camp, what supervision was exercised over them?—Their names were registered, and their clothes were washed. Under the supervision of the Police they went into Hardwar to perform their religious ceremonies and buy things in the bazaars, and do whatever else they wanted to do.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Metcalfe Hall, Agra.

TWENTY-SEVENTH DAY.

Friday, 13th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Dr. A. E. WRIGHT, M.D.
Mr. A. CUMINE.
Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX, (*Secretary*).

Mr. E. A. KENDALL, I.C.S., called and examined. *Mr. E. A. Kendall, I.C.S.*

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9325. (*The President.*) You have been employed on plague duty?—Yes; I was at Hardwar from the 8th of March 1897. I went there before the big fair, to arrange for that originally. I was stationed at Rurki.

9326. (*Mr. Cumine.*) In the matter of the infected towns and villages of the Hardwar Union, did you do evacuation work or the work of erecting the camps?—I did both.

9327. Please describe what you did?—On the report, in the morning, of the occurence of a case the muhalla concerned was counted; the names were taken down and the inhabitants were all out by the evening, and the camp was built for them on the same day. Carts, as many as were required, were supplied through the Tahsildar.

9328. How many camps did you erect?—A plague camp, a Plague Hospital, a segregation camp, and another segregation camp.

9329. Only three camps were there?—Those were solely the plague and contact camps, but we had about 10 or 11 separate muhalla camps.

9330. How many kinds of camps did you have?—We had the three really—we had two divisions of the contact camp.

9331. What was the principle of the division?—First the segregation A. That was for persons who

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lived in the same house with a plague case, or persons who were living in the same chappar with a plague case were put into that camp, and then after ten days, if they were better, they were allowed to go out, generally into the ordinary camps. They were kept a second period for a sort of supervision in the second camp, which we called segregation B.

9332. Then the third camp?—The general camp was for the muhallas that were evacuated—other persons beside those immediately in contact with cases. I think Mr. Winter described that at Khankal the Plague Hospital and contact camp were actually on the edge of the town; they were not completely built outside the town like our muhalla camps were. We had an old temple there in which we made the Plague Hospital.

9333. As each muhalla was evacuated it went into its own camp?—Yes. Immediately on arrival the Tahsildar met the residents of the muhalla at the camp, and pointed out to each family the chappars they were to occupy. The chappars were all erected on a fixed plan, 13 feet long, and 10 feet broad; they were erected in lines, each line being 20 feet from the line in front, while each chappar was 20 feet from its neighbour. This secured a free passage of air, and gave the inhabitants plenty of room to move about, while the distance was sufficient to obviate a general conflagration if any fire were to break out. The chappars were made of pulas or tall grass fastened on skeleton bamboo frames, and were estimated to cost about Rs. 13 each. We had to make some chappars of sirkhi, because we could not get enough chappars in the rush. Besides chappars, a number of long and short side pieces were built, and sufficient to ensure pardah—that is, that the women should not be seen—were given to any one asking for them. At first a certain number of chappars were prepared with pardah accommodation, but this was not found so practicable as the other plan In our first camp we built several with very nice pardah arrangements round them, and we found, when the Tahsildar was not watching, some other family would run into these, who had no special right to pardah, so we had to provide extra ones then.

9334. Will you tell us the arrangements you made for each camp?—Arrangements had to be made for each camp for food, fire, sanitation, water, and watch and ward. Arrangements for food were made through the Headmen or chaudhris of the Banniahs. A wholesale shop was organized at the original camp, and small shops in each camp, where some Banniah whom the chaudhri deputed sat and sold his wares. A fixed price for each kind of grain was settled with the chaudhri, and there was never a single complaint of high prices. For country produce a place was pointed out, where, at a fixed hour each day, persons from villages round might bring roots, turnips, and such like produce, and all who desired anything of this kind would go there at that time. Halwáis to make sweetmeats, and Bharbhujas to parch gram for the lower classes, were arranged for at first, but subsequently people volunteered to open shops, and they did a good trade. Tobacco and pán shops too, and a cloth shop, were opened by enterprising inhabitants as they settled down. As to fire and warmth, every one of course cooked his own food, and a great deal of chopped wood was used. A special place was marked out at a sufficient distance from each chappar, where the fireplaces were to be made, and cooking anywhere else was strictly prohibited. The people after the first day or two kept most cheerfully to this rule. Wood was procured from the Canal Department, who had large stocks on the banks of the canal. Enough for about three days supply was taken at a time, so that waste and petty pilfering was reduced to a minimum. This wood was sold at a cheap rate to the inhabitants of the camp at a fixed hour each day. A special officer was in charge of this, a daily list being made out by him. There is a peculiarly cold wind, the dadu, which blows down the Ganges valley at night, and it was very cold in the camps. Accordingly to one side of each camp a hole about 4 feet across and 1 foot to 1 foot 6 inches deep was made and filled with logs of wood. This made a most excellent camp fire, and the inhabitants of the camp would meet round this fire every night and talk, while, after they had retired, the warm air from the fire was blown through the camp and the temperature noticeably raised. Special latrine accommodation, on a spot pointed out by the Medical Officer, was provided for each camp, and sweepers from the town were attached, chappars for their residence being provided near the latrine. Additional sweepers were detailed for each camp, who swept it up morning and evening. These sweepers were paid 3 annas a day, a mate or jamadár, who received 4 annas, being appointed when necessary. A number of sweepers were retained from Saháranpur and Deoband Municipalities, as the number available on the spot was not found sufficient. I might note here that a sweeper camp nearer the town was erected, and all those sweepers for whom there was no work to be found in the camps lived there. As to water; Kahars, and if necessary Bhishtis, were attached to each camp, whose sole duty was to go to and fro bringing water from wells and, after the canal was opened, from the canal to their camp. This went on all day. These men worked most willingly, and doubtless the inhabitants of the camp made them some small allowance, for every one's ghara was always full. These men received 4 annas a day, and a Headman on 5 annas was appointed where the number of Kahars exceeded five. A register of sweepers and Kahars was maintained, and they were paid at first every day, and when their number increased, three times a week, in the evening, in the presence of the Tahsíldár, on production of a certificate signed by the official in charge of their camp. Sufficient police from the force detailed for plague duty were attached to each camp, to patrol at night, and keep watch and ward. These were the ordinary points which required attention on each evacuation. Many other improvements for the comfort of the inhabitants were introduced from time to time. For instance, many persons had cows with them. A list of cattle was made for each camp, and as much fodder as asked for was requisitioned every day from some neighbouring village. There were particular chaprásís ready, who would go messages to Jawalapur or to villages round, to fetch anything wanted or to call friends. Sanction to send for friends was only given by the Joint Magistrate when he made his daily round. Friends and relatives were allowed to come, but if they came to the camp, they were bound to remain there ten days. At Jawalapur this was not insisted on, but at Kankhal the Kankhal-Jawalapur bridge was allowed as a meeting place, and when the guard there announced that a visitor had come, the person who wished to see him was taken by a chaprásí or such person, and allowed to meet and converse with his friends. Such were the principal arrangements for the convenience of the inhabitants. To ensure that a proper time was spent in the camp, and that the rules were observed, a Náib Tahsíldár on Rs. 50 a month, with, in the larger camps, a selected patwári on Rs. 10 to assist him, was deputed to the charge of each camp. His duty was to keep up a list of the inhabitants, and to hold a roll-call every morning at 7 o'clock, the Tahsíldár in general charge going round with some one of them each day. He saw to the general cleanliness of the camp, reported any case of sickness immediately to the doctor in charge, and gave certificates to the menial servants employed. He went round again each evening and took the names of those whose time was up and who wished to leave the camp next day. The doctor was informed, and all arrangements for disinfection of their clothing were made in time for this to be undertaken the first thing in the morning, as each family left the camp. A certificate was given to the head member, showing how long they had resided in the camp. All those departing by train went with a chaukídár, who carried a list, which was countersigned on their departure by the official in charge of railway inspection at Hardwar. These lists were forwarded to the Joint Magistrate at Hardwar, and notice sent to each district immediately, stating the number of departures and the date and train of departure.

9335. Were any special arrangements made for the poor?—There were a great many poor people in the camps, for whose livelihood arrangements had to be made. In the case of Kankhal this cost but little to the Government, as there exist large organized charities in some six or seven places. Some thousands of rupees a year are allowed by a wealthy Hindu for feeding the poor at Kankhal. The management of the money is in the hands of some appointed agent, generally a Banniah or a Khatri. A daily distribution of grain to a fixed amount is made to all who come and ask for it. Such an arrangement is called sadabart. Some of these sadabarts ceased operations on their evacuation, but some, on the contrary, continued as before to distribute grain, and many poor people were kept from starvation by these means. A Calcutta

gentleman provided the means for supplying many blankets to those who required them. To those who were not relieved by the sadabarts ⅝ seer of wheat flour and ⅝ seer of pulse or dál were given every day by Government. The list was checked by the Joint Magistrate, and only such people as could not labour or find any means of existence were brought on this free list. To find labour for them was a problem. To the women the clearing of the grass and weeds for new camps and in the vicinity of old ones, for men work on the chappars, wood chopping or some such work was found; many spent the day on the special work which had been opened for them, nearly 1,000 a day being occupied for some time. Others did their own work. The Bhishtis at Jawalapur sold us a great deal of ban rope, which they made in the camps. Potters, who had turned to wood carrying for a livelihood, were allowed to go out and get wood, selling it to us. All the beds and tables used in the Plague Hospitals at Jawalapur and Jagjitpur were made locally in the camps, and a clever carpenter who was in Jagjitpur camp turned out two very good cupboards, which were priced at Rs. 30 each and made over to the police for office work. There was even a snake charmer and conjurer in the Jagjitpur camp, who had, unfortunately for him, been staying in the village where the plague was discovered. He made a fair income in the camps and from the officials. The rates paid for daily labour varied from 5 annas for mates to 6 pies for small children, and was all distributed by the Tahsíldár personally every evening. With regard to the poor, there is one thing I should like to call attention to. Gobind Jas, yesterday, led the Commission to believe that everybody, practically, was fed and clothed by Government when they came out into camp. As a matter of fact, Government gave no blankets at all, and the account for food was very small indeed, because of these charitable distributions which were organised there, and because a lot of money was sent from Calcutta to feed the poor.

9336. Will you continue your statement?—To one side of each camp were located two chappars for observation of cases. Any case of fever was immediately removed there on discovery. If it was found to be plague, the patient went off to the Plague Hosptal, and the chappar was burnt down and replaced by a new one; if the sickness was ordinary fever, the patient returned to his own chappar on recovery. Separation from the camps on the expiry of ten full days was not compulsory, and a few persons at Kankhal elected to remain there. They did, however, finally leave. In Jawalapur, however, scarcely any one left, although such departure, except to Hardwar or Kankhal, was optional from the first, except for directly infected persons. Hence it came about that a few persons were left in each camp, requiring separate guards and separate arrangements for food, &c. The two eldest camps were selected as the best and most central, and those who elected to remain were gradually moved into these, the camps they left being dismantled and stacked near the occupied camps. When plague decreased at Jawalapur, more chappars were thus fixed than were required, and a good many were sold to people returning to the town, who were only too pleased to be able to purchase some temporary covering for those parts of their houses which disinfection work had thrown open. Sweepers, Kahars, police, all were proportionately reduced as time permitted.

9337. What arrangement had you for passes?—During operations at Kankhal no one was allowed to visit Hardwar or leave the camps until the expiry of the proper period, and then, if they left the camps, they were not allowed to return. By the middle of December, however, there was no one at all in the camps who had not been there for three weeks at least. All restrictions were then removed, and people were allowed to move to and fro as they pleased; the only pass system in vogue was one for allowing persons in the camp to visit the town to see to the disinfection of their houses. Every morning the medical officer of each gang would send up a man with a list of the persons whose houses would be undertaken that day, and such lists were endorsed by the Tahsíldár, such endorsement serving as a pass for the people enumerated in the list. The same applied to Jagjitpur. In Jawalapur, however, the regulations were not so strict, and all persons desiring to visit Hardwár and Kankhal could do so on obtaining a pass, which was examined on the road and returned to them. The Náib Tahsíldár in each camp had his own book, and from that he gave out a numbered pass, retaining the counterfoil. The letter P was shown in the attendance register against each person thus leaving the camp. Every evening at a fixed hour, after the ordinary hour at which they were wanted to return, all persons who wished to go out next day visited the Náib Tahsíldár, who endorsed their passes for that date, keeping a rough list, which was verified next morning when the attendance was checked. This system worked very well, and took but little time each day, whereas the distribution of fresh passes would have taken long. In all some 12 permanent passes were given to leading men and to the Banniah chaudhris, which entitled them to pass to and fro at all times. The Plague Hospital camps, except in Kankhal, were all on the plan I have already described though, of course, no passes were allowed from them as a rule. Plague Hospital, segregation camp A, segregation camp B, in all three camps were formed; neighbours of plague cases, and convalescent plague cases, went into observation A, and after ten days into observation B, where they stayed until the medical officer allowed them to depart. Passes to go out to labour were given from segregation B after the month of February by the medical officer in charge of the camp. Executive officials had nothing to do with these camps, except to erect them, and to provide food, water, sweepers, and watch and ward. Special Kahars were kept on the Plague Hospital all the while, but the sweepers and police required special arrangements. They were relieved every ten days at the Plague Hospital and moved to segregation A, relieving others, who then moved to segregation B, from whence they were detailed to other duties. This was necessary, as no one could be sent from Plague Hospital to outside work without a proper period of segregation.

9338. You say that "executive officials had nothing "to do with these camps, except to erect them, and to "provide food, water, sweepers, and watch and ward." Then who had to do with them? Who did the rest of the work in connection with them?—There was a Hospital Assistant in charge of these camps. We had not our Naib Tahsildar in charge, as we had in our own camp. The register was kept up, and the roll-call was made every day by the Hospital Assistant in charge.

9339. Did the Deputy Commissioner, then, not control the camps?—He used to go down in the morning and see if the people wanted anything; but they were under the Chief Medical Officer.

9340. I think that at Ranimazra the camp could not be prepared in time?—No. In Jawalapur, and other villages where plague broke out, camps on the above lines were formed. At Ranimazra the camp could not be prepared in time. Information reached Hardwar in the morning, Dr. Eiphick and the Joint Magistrate reached Ranimazra by 12.30, the roofs were taken off sufficient houses of the infected muhalla to make a covering for the night, and the inhabitants carried them out and stood them up, and by 4 o'clock the muhalla was empty and in flames. The camp was erected next day.

9341. Were private camps erected anywhere?—At Jawalapur all who wished to do so were informed that they might leave the town and go into a camp of their own erection. Sites were allotted on all sides, and several thousand persons availed themselves of the offer. A great deal of púlá grass for chappars was sold to them from our stock, and a good many made their own arrangements. It was not found possible to insist on the standard plan for all these camps; some built a fine chappar hut, some carried out the roofs of their houses, some only stretched cloth on poles to cover them. The Muhammadans had two camps, the Brahmans two, the Chauhans and Julahas one, the Banniahs two at one place, while there were one or two smaller "family" camps. Each camp was expected to build a private Plague Hospital for itself, in which case removal of cases to the public Plague Hospital would not be insisted on, but this was not done, except in the case of the Julahas, and finally, in the beginning of April, Government erected chappars near each camp for a Plague Hospital. Hereditary Kahars and sweepers were attached to the camps where that part of the town resided in which their work had always lain, and a certain number of sweepers were attached to each camp to keep it clean, these latter being paid by Government. A small police guard for patrol was allowed to each camp, and they were advised to organise a fire patrol.

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9342. How were the disinfecting coolies lodged?—All coolies employed in disinfection work lived, as far as possible, in a separate camp, with wives and children. They were accommodated in huts 7 feet long, and had their separate latrine accommodation and food supply.

9343. Are there any incidents of the camp life worth recording?—The Kankhal people in particular settled down very easily and quietly to their temporary life. People died and were born; readings of the scriptures were organised; and one man opened his school again. At Jawalapur a chappar in one camp was given as a chabutra, a gathering place for the camp, and the Shastras were read there for some days. The Id and the Holi festivals both came on while the people were in camp. There is a particular Idgah where all Muhammadans congregate for the Id, and all persons were put on their honour to go there to public prayer and return to the camp on the day of Id. Not one person absented himself after 4 p.m. The same with the Holi, for which poles had been erected at various places in the town, round each of which the people would dance and sing. A succession of streets was thrown open to them, and all Hindus were given permission to go, provided they kept to these streets and returned. Not one person was missing next morning, nor was any one apprehended in the closed parts of the towns. One chappar caught fire in Kankhal camps, but it did not spread. There were three fires in private camps in Jawalapur, in which much property was destroyed; one was the result of careless cooking, one remained unexplained, while one, the most serious, was said to have been caused by a woman who wished for a child. She is said to have thrown a burning dung cake into a roof, in the belief that the conflagration would please the particular god whose help she looked for.

9344. To go back to the beginning of your statement. You told us that on the report of the occurrence of a case of plague in a muhalla, the muhalla was evacuated. Please say how you got the information that the case had occurred? Had you search parties, or volunteers?—No, we had no search parties at all, except that first day, when we had a house-to-house search of the whole town. There was a regulation that every case of sickness must be reported at the Police Station immediately on its occurrence, and then the Assistant Surgeon in charge visited the case, and if he found it suspicious, then he reported in the morning to the Medical Officer, who came down with the Executive Officer, and we visited the case, and if it was seen to be plague, orders were passed.

9345. Did you find that the people, when out in camp, did anything voluntarily in the way of reporting cases of plague amongst their neighbours, and isolating them? That was done at Karachi to some extent. Did you find that it was done here at all?—We only had two or three cases in our muhalla camp at Kankhal, and they were all reported by the neighbours to the Hospital Assistant in each case. At Jawalapur they did their best to conceal it—they had private camps.

9346. Is it a cotton country?—There is very little cotton there.

9347. There were not large stocks of cotton in the people's houses?—No.

9348. Are there any mills there, spinning or weaving mills?—No.

9349. (*Mr. Hewett.*) What time was taken up in evacuating those places? Did you succeed in any one instance in getting people out at once?—In Kankhal we only took it by muhallas.

9350. At Ranimazra did you get them all out at once?—Yes, we got them all out at once.

9351. Immediately?—Yes. It was a small muhalla, about 50 yards from the village, where the Chamars and the sweepers lived.

9352. They were evacuated as soon as you heard of plague?—Yes, the next morning, as far as we know.

9353. Did your subsequent inquiries lead you to believe that you found the plague there immediately after it occurred?—I believe we did.

9354. (*Dr. Ruffer.*) Have you heard of cases of plague among monkeys?—I saw a certain number at Kankhal.

9355. Were there many monkeys sick of plague there?—We found about 20 dead monkeys in the town. I do not think specimens were taken in all cases, but I know plague was found in them. I cannot give you exact details.

9356. Does not the fact that you found 20 dead monkeys show that there was very large mortality among these animals?—I should think a huge mortality, because, in the ordinary rule, one never sees a dead monkey. I have never seen a dead monkey before.

9357. You think they must have died very quickly?—Yes.

9358. When a monkey is sick, does he remain in the town?—The natives have an idea that they go out into the jungles to die. I do not know whether there is anything in that.

9359. Have you any actual observation on that point?—No; I know that at Kankhal the monkeys left the town in large numbers: they went to Jagjitpur.

9360. How do you know they went to Jagjitpur?—One morning I went down to the Kankhal camps, and about half a dozen of the Jagjitpur zamindars came over in a body and complained that their crops were being destroyed by these monkeys who had left Kankhal.

9361. Is not it a fact that, as a rule, the monkeys of one locality do not leave that locality?—Not, as a rule, at all.

9362. They frequent certain places, and live in those places?—Yes. There were not many monkeys to speak of in Jagjitpur. In Hardwar and in Kankhal there are thousands of monkeys. They have nothing to do with each other whatever. A Kankhal monkey could not get into Hardwar. It would be killed in 10 minutes, if it did.

9363. You think a great many emigrated to Jagjitpur, and that they may have carried the plague there?—I cannot say medically, of course, but it seems possible.

9364. Were you in Kankhal during the whole time of the epidemic?—Yes.

9365. Did you pay any attention to the cordons which were placed round the place?—Yes.

9366. Do you believe that those cordons were efficient?—To a certain extent; they could not be absolutely efficient.

9367. Do you believe that the people in the camps occasionally went into the town, surreptitiously?—I do not think that was the case so much at Kankhal, because there was nothing for them to go into the town for; the town was completely empty.

9368. If you evacuated the town completely, was there any reason for them to go back? Did they want to go back?—No.

9369. In Kankhal were you able to trace any cases of plague infection through grain?—I cannot say anything about that.

9370. Did you ever see a case of intestinal plague?—I saw two or three *post-mortems* on plague cases where there have been no external buboes of any kind.

9371. Have you any reason to believe that plague may occasionally infect the system through the alimentary tract?—There was one *post-mortem* in which the mesenteric glands were all hugely enlarged; a long row of buttons completely round the mesentery.

9372. Did you see any cases of plague infection by the tonsils?—No, I never saw a case of that sort.

9373. (*Mr. Cumine.*) You have spoken of people leaving the camps after the expiry of 10 full days, and you say that, except at Jawalapur, most of the people did go away?—At Kankhal they did finally all go away.

9374. They were not allowed to come back into Kankhal. Then where did they go?—A lot of them went to the Punjab. A good many went to Meerut, I remember, and Muzaffarnagar. I had a list; I do not know whether Mr. Winter has got it among his papers, but I made out a list showing where everybody had gone.

9375. During the 10 days that they were not allowed to go out, there were crops on the ground, were not there?—Not with the Kankhal people: in Jagjitpur there were.

9376. Who looked after the crops during the 10 days?—Mr. Winter made an arrangement for that. There

were a certain number of guards that they always had at night. A list was made of them, and the people were given passes allowing them to go into their fields at night and return in the morning.

9377. I suppose in these towns there were a certain number of shopkeepers, grain-sellers, clothes-sellers, tobacco-sellers, and so on?—In Kankhal there were.

9378. Did you, after the evacuation, make a set of booths in the camps for these people to sell their things in?—Not a set of booths. We tried that at Hardwar when the big fairs were beginning, and all the lodging houses were closed. We built a large camp for all the pilgrims to stay in. We built a line of booths there, but no one would go at all. We had great difficulty in even getting a Banniah to come.

9379. They were in the camp already, were not they?—No, not in this camp. One or two started a shop in Kankhal and Jawalapur, as I have stated above, and we gave them a small lean-to, which they put at the side of their own chappar in that case.

(Witness withdrew.)

Captain J. CHAYTOR-WHITE, I.M.S., called and examined.

9380. (*The President.*) You are Deputy Sanitary Commissioner for the North-West Provinces and Oudh?—Yes.

9381. Where have you had special experience of plague?—In the Hardwar Union—specially at Kankhal—and also at Hardwar itself.

9382. Between what dates?—Between the initial outbreak on the 8th of April 1897, with an interruption when I was not there of about three months, almost continuously up to the 20th of May 1898.

9383. (*Dr. Ruffer.*) In the précis of evidence which you have placed before us, you state that the introduction of plague through the skin does not occur as frequently as is generally supposed?—No. I am rather of opinion that it does not.

9384. Will you state your reasons for your opinion?—I think that the feet, the limbs, and the hands of a native are extremely hard. The soles of the feet and the palms of the hands—especially the soles of the feet—in Indians are extremely hard. I have examined a considerable number of natives, and I have never been able to satisfy myself that they are particularly liable to abrasions of the skin. I do not see exactly why one should accept it without a good deal of proof, and satisfactory proof, that that is the chief method in which the bacillus enters into the body.

9385. How do you think the bacillus enters the body?—I am not prepared to say. Of course one might make a series of probable guesses.

9386. Have you any theory of your own?—There are certain ways in which bacillus might enter the body. Of course, they are only guesses, because, as I say, I do not know. For instance, there is a possibility of introduction in the same way as the parasite of the mosquito is supposed to get into the blood in malaria. I do not see why from the bite of a flea one might not be inoculated. Of course, there is the possibility of inoculation through the lungs—in pneumonic cases—and possibly dietetic infection also, and no doubt in a considerable number of cases inoculation also occurs.

9387. Have you any facts showing the possibility of human beings becoming infected with plague by fleas or by bugs?—No, I have no facts; I only give it as a possible method.

9388. Is it not the fact that buboes generally appear in the axilla and in the groin, and are not the feet and hands just the parts which might be accidentally inoculated?—The feet and hands are certainly the most likely places for the inoculation.

9389. I take it your argument is that, in the large majority of cases of plague, no lesions of the skin are discovered?—No lesions are demonstrable, and another point is the large proportion of actual bubonic cases that occur—inguinal buboes and axillary buboes combined. The bubonic cases represent about 75 per cent. of the whole number of cases. That is a very large proportion, and it is very difficult to conceive, without satisfactory proof, that in all those cases there should have been abrasions of the skin. Take the cases of the axillary buboes—about 14 or 15 per cent. of the total cases are axillary buboes. A native uses his hands a great deal—certainly not so much as his feet—but he uses them a great deal, and the hands being more tender, I should have expected to have found more than 15 per cent. of axillary buboes, if there had been inoculation through abrasions of the skin. I have not been able to find abrasions of the skin in human beings, and I have been able to find no actual points of inoculation that I could definitely lay my hands on, either in the case of human beings or of monkeys.

9390. Do you think the point of inoculation must be necessarily so large as to be visible? Supposing, for instance, you squirted in plague with a syringe, would you then be able to point out the place of inoculation?—There you have a sharp point entering the skin.

9391. Why should not a man infect himself by treading on a sharp stone or a small piece of wood or a thorn?—As a matter of fact, sharp stones are extremely rare in certain parts of India, because the roads are all kankar. A man going along the road is very unlikely to hurt himself, as they are nearly all round stones. A thorn, perhaps, would be more likely to hurt him. I have very often seen a native pick a thorn out of his foot. It never goes very deep into it, but he knows the thorn is there and he pulls it out. The skin is so hard that it never causes him the slightest trouble, and immediately he puts his foot down I should think the hole is covered up pretty rapidly.

9392. Supposing the infection takes place through the lungs or alimentary tracts, how do you account for the bubo being generally in the axilla or groin?—I think it very probable that a proportion of cases in which the buboes occur externally are due to inoculation.

9393. Is it not the fact, in the cases related by Professor Childe in Bombay, that the original lesion in which he found the bacilli was always on the same side as the bubo?—I am not sure, but I think it is so. In a case in which a man inoculated himself on the hand, the bubo undoubtedly was on the same side, but it was not an axillary bubo. The case occurred at Jawalapur, under the charge of Drs. Scotland and Elphick, and I did not see the case till my return from being with His Honour the Lieutenant-Governor. The man was my best Hospital Assistant, and helped in most of our *post mortems*. His name is Ibrar Hussain, and he inoculated himself on the back of the right hand while doing a *post mortem*, a bit of projecting rib scratching and tearing through about 1½ inches of the skin. He did not notice it at the time, and it was not until he had finished the dissection that he saw it, when he applied carbolic acid and strong corrosive sublimate to the scratch. Symptoms of fever came on about 36 hours afterwards, and 48 hours afterwards he was decidedly ill. About 60 hours after he complained of pain in his side and an enlarged gland was found at the right side of the chest (one of the chain of glands at the side of the chest at the border of the muscle). The supra trochlear and the axillary glands were not enlarged nor inflamed, nor was there any pain in the arm or hand. There was no suppuration at or around the scratch, the slight eschar caused by the strong disinfectants scabbing over at once. There were no lines of inflamed lymphatics extending up the forearm or arm. He had a typical attack of plague and very nearly died. He had great care and attention paid to him by two medical officers, as he was a favourite and a good subordinate. The gland never became very large, and did not suppurate, and could be felt for some months, hard and indurated, about the size of a pigeon's egg. He had fever and nervous symptoms before the gland became enlarged.

9394. Do you agree that tetanus is chiefly due to accidental inoculation?—Yes.

9395. Is it not the fact that in some cases of tetanus the point of inoculation cannot be found? May not this be the case in plague also?—Yes, it is possible.

9396. In your précis you quote Staff Surgeon Wilm, who was at Hongkong during the epidemic, and he says, "In the great majority of cases the buboes do not "appear until after the onset of severe symptoms of "blood poisoning;" is that your experience?—Yes. I have noticed in many cases that it has been so.

9397. Is not it the rule rather that bubo is the first thing noticed?—I think that is so a great deal

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because probably one does not find the case out early enough.

9398. But in some patients has this not been the case?—I am not sure of that. I would refer you to the case of the Hospital Assistant I have just given.

9399. Do you believe that grain may carry infection?—Yes; I think under certain conditions it is quite conceivable that grain might be infectious.

9400. What conditions would render grain infectious?—At the time, for instance, when plague is prevalent amongst rats, and is being spread by the rats. I should think very likely at that time that grain is infectious.

9401. Is the grain in this part of the country generally stored in sacks?—It is generally stored openly.

9402. Do you think that rats running over grain might infect it?—They might.

9403. In what way, do you think, could they infect the grain?—I think the bacillus might remain with grain for a certain period.

9404. How could the bacillus pass from the rat on to the grain?—Through the excreta.

9405. The infection would only be at the spot where the excreta touched the grain?—Yes.

9406. Do you believe it is possible to disinfect grain?—That is rather a difficult question to answer. The attempt has, of course, been made; I have made it myself.

9407. How did you make that attempt?—That was by exposing it to sunlight.

9408. I believe you are rather sceptical as to the possibility of disinfecting by sunlight?—Yes.

9409. Will you tell us why?—I think that in instances where grain is exposed it might be more satisfactory than in clothes, where the bacillus might be in the texture of the cloth. For instance, we take out a lot of new clothes that have not been worn, from boxes, and they are exposed to sunlight; they are not disinfected by other means, because they have not been worn. Still, these clothes might have been contaminated, and we expose them to sunlight for the simple reason that we, on *à priori* grounds, consider it sufficient.

9410. Why are you of opinion that sunlight does not disinfect clothes?—Because I think the bacillus, either from say the excreta or urine, might get into the clothes, and it might remain in the texture of the clothes, and the sunlight would not be sufficiently penetrating. Whereas in the case of grain, where the bacillus might remain on the outside for a short time, the sunlight and the oxidation might possibly be stronger.

9411. But the under surfaces of the grain would not be exposed to sunlight?—We turned all our grain over at Kankhal. We had a specially prepared place; we spread the grain out in layers, and we had it constantly agitated, and we soaked our bags in lotion.

9412. Do you think sunlight has a disinfecting action in the absence of moisture?—I think so.

9413. Why do you think so?—I think the exposure to sunlight and the consequent oxygenation is sufficient to have a disinfecting effect.

9414. Have you any special experiments bearing on that point?—No.

9415. You state in your précis of evidence that in some cases the disease is very mild, for instance, "in "children who go about with the disease on them. "These cases should be isolated when detected as they "probably spread the disease." I suppose you refer to mild bubonic cases?—Yes, in children.

9416. How could a child going through a mild form of bubonic plague spread the disease?—Through the excreta.

9417. Has the bacillus of plague ever been found in urine or excreta except in septicæmic cases?—No; that is, I believe it has not.

9418. On what facts do you base your opinion that the excreta are a source of danger?—I think that is the way the bacillus leaves the body—through the excreta.

9419. What evidence have you got to show that the bacillus leaves the body in that way?—I have got no evidence on the point, but that is the way I conceive it.

9420. Have you made any experiments bearing on the point?—No.

9421. In order to get into the excreta the bacillus must first pass through the blood. Is that not so?—Yes.

9422. Now, in mild cases, has the bacillus of plague ever been found in the blood?—Not that I am aware of.

9423. I suppose these buboes often suppurate?—As a matter of fact there was a case in a child in which they did not suppurate.

9424. In other cases they might suppurate?—Yes.

9425. Has the bacillus of plague been found in a suppurating bubo? I do not mean in a bubo that has been opened and has suppurated, but a bubo which has suppurated and has opened spontaneously?—Not that I know of.

9426. Then I do not see how these children can be infectious?—Through the passage of the urine or fæces.

9427. But it has never been found in the blood?—That does not say it is not there.

9428. You think that although present it may not have been found?—Yes.

9429. Have you any facts bearing on that point?—No.

9430. You attach great importance to the early detection of the first cases. In this country how do you think early cases could be detected in a village where you have no suspicion that the plague exists?—Your attention at first would be attracted to it, I suppose, owing to the death rate being higher than it should be, and in that case one would take steps to send out somebody competent to examine the bodies and see whether there were cases of bubonic plague or not.

9431. Then you must have corpse inspection, is that not so?—Then it comes to be a case of corpse inspection.

9432. Do you think it possible to carry out corpse inspection in this country?—I should not say it was in every community, but I think in a great many communities it is quite possible.

9433. Do you think it is possible to examine women?—I have done so.

9434. Do you think you could occasionally diagnose a case of plague pneumonia by corpse inspection?—I am not prepared to say that I could, in every case, swear to a pneumonic case by corpse inspection.

9435. What I mean is, could you get a very strong suspicion that a person had died of pneumonic plague from inspection alone?—I do not think it is possible to be certain it is a pneumonic case without a *post mortem* examination of the body.

9436. You believe in segregation of the infected, and thorough disinfection in every house in the town. Why do you think every house in the town should be disinfected?—Because we have found in many cases where we had left certain temples and houses on the outskirts and people in them, where there were reasons that we could not remove them, that cases had occurred.

9437. That seems to show that the plague virus was diffused far more extensively than was supposed?—Yes.

9438. Do you think that in a large town it would be useful to have medical corpse inspection carried out at the burning ghats and burial grounds?—At the places where a corpse inspection is considered feasible by the executive authorities, I should think it would be very desirable.

9439. Do you think that if the people were told that either they must have the body examined or else the case will be considered as a case of plague and measures enforced, they would object to corpse inspection?—No, we have tried that. As a rule, they prefer corpse inspection rather than to have the case treated as a case of plague. We have had that in the case of women.

9440. (*Mr. Hewett.*) Have you ever examined the corpse of a Muhammadan woman?—No, I cannot remember to have examined one.

9441. Do you think that Muhammadans of good social position would like the corpses of their women examined?—I think, in preference to having a whole family segregated and undergoing the troubles and difficulties of segregation, they would be prepared to do it in many cases.

9442. Have you had much experience of the feelings of Muhammadans of high social position in big towns?—No.

9443. Were you in Hardwar at the time when the plague broke out there?—Yes.

9444. Did you in some cases disinfect houses without turning the people out into the camps?—Yes.

9445. How long did that take?—The house was generally finished during the course of the day.

9446. What happened to the people during the process of disinfection?—They came out of the house.

9447. Did they object to that in any way?—No. They stayed behind and looked at their various goods and chattels being disinfected.

9448. You say, in a pamphlet which you have written on the plague in Kankhal,* that mortality among rats appears always to precede and portend an epidemic. Was there any mortality amongst rats in Hardwar?—We did not detect any. We did not see any mortality among rats when we came to disinfect the town.

9449. Upon what do you base the opinion that mortality amongst rats precedes an epidemic?—From experience at Kankhal and other places.

9450. When you refer to experience in other places, what do you mean?—Hearsay and what one has read concerning other places.

9451. Do you think it possible that the mortality among rats and the outbreak of plague began concurrently in Kankhal?—No, I do not think there was any plague at that time in Kankhal while the rats were dying.

9452. Was there not one case beforehand?—Yes; that was in Hardwar, but it came into Kankhal.

9453. Could not the rats have become infected through that case?—That case came in late at night, and I disinfected the place very early the next morning. It is hardly possible to conceive it.

9454. Have you any instance of any case in which there has been mortality among rats without an imported case of plague having previously occurred?—No, I do not know of any case; but, of course, it is not necessary to have a case of plague. You might have clothes sent from one place to another, and the rats might take it possibly from other sources—from grain and other exports.

9455. (*Mr. Cumine.*) Is the raw grain the people eat not scorched—not burnt in some way before they eat it?—As a rule it is; but the Hindu especially eats a lot of grain that is not parched at all. He buys it parched, and prefers it parched; but he will also eat it unparched in large quantities.

9456. (*Prof. Wright.*) Do you think plague was introduced into Hardwar by clothes, or do you think that it may have been introduced in some other way?—I think there is a possibility that it might have come from Sind through the parcels of clothes, or bags, in which the Sindis wrap bones. The bones of people who die in Karachi are sent to Hardwar to be deposited in the Ganges, and when the people cannot bring them themselves they send the bones in bags, very often by post; and it is just possible that the bags that came from Karachi might have brought the plague with them.

9457. Are these parcels of bones sent through the Post Office?—They are sent in bags and boxes to the Post Office.

9458. Were there any cases of plague among the officials of the Post Office?—No; but all round the Post Office there were. The first case was close to the Post Office in Hardwar. In Kankhal, of the first 20 cases that occurred in the town, the people who got it most were the people who take clothes from the dead, who are known as Acharaj.

9459. How many cases were there among the Acharaj?—Nine in the first 22.

9460. Had you any cases later on among the Acharaj, when the plague clothes were burnt?—No, we had no cases later on amongst that class of people.

9461. You said you made *post-mortems* on monkeys who had died of plague?—Yes.

9462. Did you say that you found buboes in the axilla and thegroin?—Yes.

9463. Did you, in any single monkey, find buboes in both the axilla and the groin; or were the buboes found only in a single region of the body?—Yes; in three monkeys I found both the axilla and the groin affected.

9464. Did you find any monkeys with only buboes in one region?—Yes, one or two.

9465. How many *post-mortems* did you make on monkeys?—I am not quite sure—either nine or 10. In two or three I found that the glands of both the axilla and the groin were enlarged; and in one or two monkeys the glands in only one position of the groin chiefly were enlarged.

9466. Were there any monkeys who had no buboes at all?—Yes.

9467. You have spoken about mild cases of plague occurring in children. How mild were these cases which you speak of—were the children able to walk about?—They were able to walk about.

9468. Do these cases correspond to what is described as *pestis ambulans*?—Yes, although I have not seen *pestis ambulans* known as such.

9469. Have you seen similar mild cases of plague in adults?—No, only in children.

9470. How were these cases brought to your notice?—We examined these children.

9471. How do you differentiate these cases, which you regard as mild cases of plague, from other cases of glandular swelling in children?—There was no reason for the bubo that we could see.

9472. Did these cases you speak of occur in connexion with houses where there was actually plague, or where there had previously been plague?—Yes. The reason why it was considered suspicious was that it was actually next door to a plague-house where a plague case was.

9473. Could you give any details about these cases? Could you put in a list?—I could give you the details of this one case I am referring to. The case was that of a boy aged about six. It occurred in Kankhal, at the beginning of the epidemic, in a house next to one that had contained one of the earliest cases of plague. The temperature was slightly above 101 degrees, and there was an enlarged femoral gland—not painful—and with no surrounding œdema. The child was moving and walking about, and, although ill, was not manifestly so. There was no other glandular enlargement, and the gland, which did not suppurate, remained as an indurated nodule under the skin, after all fever had subsided. There were no other symptoms noticeable.

9474. Have you previously ever seen obscure cases of buboes occurring in children quite independently of plague?—I have seen children brought to me with enlarged glands—they had nothing else but hard glands—they had no fever or general symptoms, and there were no assignable reasons for the glands in those cases, except malarial or constitutional.

9475. You have told us that you have seen buboes quite independently of plague in children. May I ask you, had you any reason for regarding this case you speak of as plague, beyond the fact that it occurred near a house which had a plague patient?—The child had fever.

9476. Did you see only one child with this mild form of plague?—I myself only saw this one child. That is the only mild case I saw of plague.

9477. Did you hear of the occurrence of other cases?—We heard there had been other cases of children with mild buboes.

9478. Did you see any cases of enlarged glands occurring, independently of fever, among the doctors who attended plague cases, or among the people who disinfected the houses?—No.

9479. Have you any reason for thinking that the infection of plague can move about from place to place independently of the agency of rats or men?—No, I have not—independently of clothes, human agency, or animals.

9480. Did you see those cases of plague which Mr. Winter spoke of as occurring in houses situated on the fringe of an evacuated area?—Yes.

9481. Do you think that the occurrence of plague in these houses could be accounted for by assuming that it had been brought there by the movements of men or rats?—Yes, I think it could. In those cases

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that occurred on the fringe of the evacuated areas, I think they occurred through, as I say, human agency, or rats or other animals.

9482. Is it your opinion that plague cases spread in concentric rings round about the contaminated focus?—I did not notice that peculiarity.

9483. You say you do not think exposure to sunlight kills the infection of plague in clothes; have you any data to show us as to how long the infection of plague may remain in clothes that are kept in the dark?—I can give you a case of a man, which occurred in the segregation camp. The man was there ten days—not in the contact camp, but in the segregation camp. He had been turned out of the town, and had had no connexion with a previous plague case. On the ninth day after he had left the town he developed plague. We found, on the seventh day after he left the town, that he had opened a box.

9484. This man, you say, had not been in contact with any other plague case during that time?—Not that we knew of.

9485. Had you any means of finding out whether he had or had not been in contact with other plague cases?—No, we had no certain means.

9486. Did he impute his plague to the fact that he had opened this box?—He did not impute it to anything; we imputed it to that.

9487. Why did you impute it to his having opened the box?—We had no other sufficient reason for supposing that he got it in any other way. He had not left the camp.

9488. Had you any reason to suppose that the clothes in the box were plague infected?—No, except that it came from a plague town.

9489. Had he and other people not opened the box frequently?—No, they did not open it; it was kept closed for a week on his own statement.

9490. Were there any cases of infection of plague when you came to open up those sealed up rooms which were discovered in Kankhal?—Only special disinfection coolies came into contact with those clothes. We had no cases there; the clothes were exposed to sunlight and disinfected at once.

9491. (*The President.*) Have you seen anything of this disease which is called Sanjar?—No, I have not seen that disease.

9492. Were you in any country where it is supposed to have occurred?—No, except in the Hills. I have been up in the Hills, but I have not been in any country where it is supposed to have occurred.

9493. Did you see anything of the monkeys that had been confined in cages?—Yes.

9494. A considerable number died, did they not?—Yes.

9495. Do you know how many of them were infected with plague?—Of the monkeys actually confined in the cages there was one suspicious case, and one in which the microbe was found.

9496. On what evidence did you conclude that the microbe was present?—On the evidence of two bacteriologists.

9497. What was actually done?—The dried specimens were sent.

9498. Did you examine them yourself?—I took the specimens. I did not do the microscopic work.

9499. You have said a good deal about the infection of plague not occurring through the skin surface?—Yes.

9500. But you instance fleas and bugs as being agents in causing infection?—As possible agents.

9501. How do they communicate the infection?—Through their bites—through the blood.

9502. Through the skin?—That would be through the skin.

9503. That would be actual inoculation?—That would be by actual inoculation, but not by abrasions.

9504. By inoculation through the skin?—Yes.

9505. Then you left the introduction pretty much to the lung surface and the alimentary canal?—Yes.

9506. What is your opinion as to the usual result of that introduction—what form of plague ensues?—Pneumonic, and possibly bubonic and septicæmic.

9507. Is the pneumonic form frequent or not frequent?—It is not very frequent.

9508. Therefore, that would be a rare form?—That would be a rare form.

9509. Then we are left with the introduction by the alimentary canal?—Yes.

9510. How do you suppose the bacillus would enter the blood through the alimentary canal?—Through the food.

9511. That would be very rapidly conveyed into the stomach?—Yes.

9512. Have you any information of what is the action of the stomach secretions on the bacillus?—No, we have no data.

9513. We have it in evidence that the acid would very quickly kill, or, at any rate, impair the vitality of, the bacillus?—It is conceivable that it might, but the contents of the stomach are not always acid.

9514. You used chemical disinfectants largely, did you not?—Yes.

9515. Did you experience any prejudice on the part of the people to the employment of chemical agencies?—At first there was a slight difficulty, but it was easily got over.

9516. What was the difficulty caused by: what did they think about it?—They thought that there was a possibility that we might be spreading some poisonous material.

9517. You got over the difficulty easily, did you not?—Yes; we surmounted it by explaining what the constituents of the chemicals employed were.

9518. In your précis of evidence I see that you lay great stress upon the early detection of cases?—Yes, as far as possible.

9519. You are at one with every one else in that opinion. Could you from your experience give us some idea as to how that could best be done?—In a previously unsuspected district it would be extremely difficult to get the very early cases, because the town registers in which the death-rates are reported are only made up monthly, and it would not really come to the knowledge of the executive officer, I suppose, until the increased mortality had directed his attention to it.

9520. That might be after an interval of what period?—That might be after an interval of three weeks.

9521. How do you think the detection could best be accomplished in a place liable to the introduction of plague? What kind of measures would you adopt to get early information of an imported case? That seems to be of primary importance?—I should place a well-qualified Assistant Surgeon—a man who has had previous plague experience—in the town to examine the corpses.

9522. That you think is all that would be required?—Yes, to absolutely make certain that you had plague to deal with. That would be sufficient.

9523. (*Prof. Wright.*) Did you see any pneumonic cases in either Kankhal or Jawalapur?—Yes.

9524. Where there many?—I saw myself actually six, I think.

9525. Where did you see them—in their houses?—I saw them in the hospital and treated them in the hospital.

9526. I want to find out whether there was any evidence of direct infection in those cases. Was each pneumonic case a focus from which a number of other cases sprang?—In each case where I saw a pneumonic case there were other cases actually in the same family.

9527. In each case?—In each where we had pneumonic cases, one or more members of that family were attacked.

9528. In cases where other members of the family were attacked, were they also pneumonic cases?—Yes, pneumonic cases.

9529. You did not see bubonic cases following on pneumonic cases?—No, all pneumonic cases.

9530. What is the largest of these minor epidemics you saw in a family—two, three, or four members?—Four members in one family, all pneumonic.

9531. I think you said there were six cases altogether?—Six. I can only remember that one case in Kankhal, and there were four cases in that family.

9532. That accounts for four out of the six cases?—Yes.

9533. In the other cases did they belong to one or two families?—Those were the only pneumonic cases we had at Kankhal. The other two pneumonic cases were at Jawalapur.

9534. What happened at Jawalapur?—In that case there were only two members attacked in the family—one or two members.

9535. That accounts for six?—Yes, that is a different epidemic; that does not refer to Kankhal.

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(Witness withdrew.)

Captain H. W. Elphick, I.M.S., called and examined.

Capt. H. W. Elphick, I.M.S.

9536. (*The President.*) I think you are a Bachelor of Medicine and in the Indian Medical Service?—Yes.

9537. What is your official position with regard to plague?—I was one of the medical officers on special duty at Hardwar in connection with the plague.

9538. From what date?—From the 22nd October, 1897, to the 11th April, 1898.

9539. We shall be glad to hear any information you may wish to give us?—At the time I wrote my précis of evidence I had no records for reference, I merely gave an outline of an interesting case of a Hospital Assistant who was inoculated at a *post-mortem* examination. I thought it was interesting as fixing the incubation period and in other respects also. I also gave a general note on the appearances which we found microscopically in the Jawalapur cases. In the notes I have made now from the records, I find there were in all 116 cases of plague discovered in Jawalapur. Of this number, 81 were bubonic and 35 had no external buboes. Of the 81 bubonic cases the buboes were situated as follows:—inguinal, 23; femoral, 21; axillary, 17; cervical, 12; inguinal and femoral, 5; cervical and femoral, 1; locality not recorded, 2; total, 81. Of these bubonic cases 22 recovered and 59 died. From 10 of the 59 who died, specimens were taken for microscopical examinations, and in all of these plague-like microbes were found.

9540. (*Prof. Wright.*) Were these specimens taken from the glands?—From the glands, and in some cases from the liver and spleen. In six of these bubonic cases, which I will detail afterwards, full *post-mortem* examination was made. Of the 35 cases which presented no external bubo, all, with one exception, died. The 35 cases included 19 of plague pneumonia, one of internal buboes with hæmorrhages and 15 were believed to be of the so-called septicæmic type.

9541. Do you mean that in these fifteen cases there were no buboes?—There was more or less general enlargement of the lymphatic glands. I have records of four *post-mortems* made on these cases and microscopic evidence.

9542. (*The President,*) The glands were enlarged in the septicæmic cases?—Slight general enlargement, but no special buboes. The glands found to be enlarged were the mesenteric glands chiefly. Of the 19 pneumonic cases 13 were diagnosed as such during life, and six were found dead. Of those diagnosed during life six were verified by *post-mortem* and microscopic examinations, and all of the six found dead were considered from *post-mortem* appearances to have died of plague, and in only one case was the diagnosis not confirmed by bacteriological examination.

9543. (*Prof. Wright.*) Do you mean that in that case the bacteriological examination was omitted?—No, it was tried, but there was a failure to detect the bacillus. Of the 15 cases believed to be of the septicæmic type 14 died and one recovered.

9544. Did all the cases of plague pneumonia die?—Yes. Four of the septicæmic cases were examined *post-mortem*, and in each of these plague-like bacilli were discovered microscopically. In one case of internal bubo with hæmorrhages plague-like bacilli were also found. 25 cases in all were examined more or less completely *post-mortem*. Two of these proved not to be cases of plague. They were suspected deaths, but when we made *post-mortems* we found they were not cases of plague. Of the remaining 23 cases, 12 were pneumonic, 4 septicæmic, 6 had external buboes and one had internal buboes with hæmorrhages. In every case there was œdema of the front of the chest; this extended to the upper arms, the sides of the chest, and to the abdomen, but was never noted in the face, hands, or feet.

9545. Has this œdema been seen during life?—No, it was never noticed during life. It probably came on immediately before death, *in articulo mortis*. It was never noticed in life. There was œdema where there were buboes; but the œdema described existed independently of external buboes.

9546. You think that the œdema occurred in the last hours of life?—Yes, in the last hours. Whether it is characteristic of plague I am not prepared to say. I have never seen it in autopsies other than plague. I would suggest that it may result from a rapid destruction of blood corpuscles immediately before death, leading to hydræmia and œdema.

9547. Did you get pitting?—The pitting was very marked indeed. It was also noticed in a few of the monkeys examined by Mr. Hankin. In three cases we noticed it together, that this œdema was present.

9548. (*The President.*) Over the thoracic surface?—Over the thoracic surface, and on the sides of the chest.

9549. In all forms of plague?—In every form that we saw. In every case there was some enlargement and injection of the mesenteric glands, and enlargement of the epiploic vessels. Every case of pneumonic plague examined showed lobar consolidation; no case of the lobular form was seen.

9550. (*Prof. Wright.*) Did the consolidation extend over a whole lobe?—The whole lobe or lobes were consolidated. No cases of the lobular form was seen.

9551. Was there much sputum in those cases during life?—No. There were only two cases which I can remember in which the sputum was marked. They died as a rule very rapidly.

9552. (*The President.*) What parts of the lung, and which lung were chiefly affected?—I have the details of each case. The following are briefly the details of *post-mortem* appearances:—

Pneumonic Cases.

1. Jowahir.—Consolidation of right apex and middle lobe. Enlarged right bronchial glands, œdema of trunk.
2. Bhawani.—Wife of Johawir. Right lung quite solid; bronchial glands enlarged and congested; œdema of trunk.
3. Fakira.—Pneumonic consolidation of right apex, and middle lobe, and left base. No lymph or adhesions. Mesentery studded with slightly enlarged glands.
4. Kewal.—Œdema of trunk. Pneumonic right lung, with slightly enlarged bronchial glands. Mesenteric glands greatly enlarged and inflamed.
5. Tusia.—Mother of Fakira. Left apical pneumonia. Enlarged bronchial and mesenteric glands.
6. Samali.—Wife of Fakira. Whole of left lung quite solid, and adhering to the ribs; the condition of the lung being that of the first stage of pneumonia, verging on second stage. Mesenteric glands somewhat enlarged and congested.
7. Jai Sukh.—Right apical pneumonia, with firm but recent adhesions over the whole of the right lung. Left lung healthy. No sign of tubercle. Abundant fat in mesentery, and enlarged glands. Enlarged gland at left angle of the jaw. Decolourised clot in right ventricle and auricle extending into pulmonary artery. Œdema of trunk.

This is a case in which from *post-mortem* appearances I must admit I could not tell whether it was an ordinary case of pneumonia, or whether it was really plague.

9553. What led you to think it might be plague?—What led me to think so was the œdema of the trunk. In this case we awaited the result of the microscopical examination before taking action, *i.e.*, before evacuating the locality where the case had occurred. The microscope showed plague bacilli.

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9554. In most of the other pneumonic cases were the appearances consistent with croupous pneumonia?—What struck me was that we never saw any advanced stage, and the pleuritic changes were so slight. We never saw any lymph of any kind, no coagulable lymph. There were only the very slightest pleuritic adhesions. Occasionally a little fluid in the pleural cavity, but never any coagulable lymph, and never any pericarditis.

9555. I suppose these patients all died early in the illness, did they not?—Some of them lived two or three days.

9556. It is not remarkable, therefore, that the pneumonia had not advanced very far?—No.

9557. (*Prof. Wright.*) Was the blood firmly clotted in these cases?—I mentioned that in this case there was a decolourised clot in the right ventricle and auricle extending into the pulmonary artery. I would not like to be sure without having definitely noted it, but such a clot is generally found in bodies dead of pneumonia. The list of cases continues as follows:—

8. Harnam.—Right axillary gland enlarged with deep red cortex. Œdema of trunk. Right lung adherent and yielding abundant œdematous fluid on section. Left lung normal. Mesenteric glands enlarged; some from which specimens were taken were markedly ecchymosed and infiltrated with blood.
9. Burhya.—Daughter of Fakira. Œdema of trunk. Right axillary gland enlarged with red cortex. Left lung solid at base. Right lung œdematous, and anterior border of lower lope hepatised (red). Mesenteric glands prominent.
10. Musammat Minnat.—Age 60 years. Body spare, but well nourished. Œdema over upper two-thirds of trunk. No enlarged external glands. On opening the abdomen the epiploic veins were seen to be full of blood, and the vessels of the small intestine injected in patches. The liver was enlarged, especially the left lobe. The mesenteric glands were enlarged slightly. On opening the chest three enlarged glands were seen on the anterior surface of the pericardium. One of these was softened by bloody infiltration, and had been cut across in removing the sternum; the other two, of dark colour, were firm on section, and not infiltrated with blood. The left lung was adherent at its base, and solid on section. No coagulated lymph or fluid in the pleural cavity. The left bronchial glands were much enlarged, and very soft and vascular on section. The right lung was slightly adherent: on section its base was found to be very œdematous, but in no part solid. The apices on both sides were healthy and there were no enlarged bronchial glands at the root of the right lung. The heart was rather fatty. The kidneys were normal.
11. Musammat Juharoo.—Age 45 years. Body well nourished. Œdema on chest and both upper arms; goitre, in connexion with which on the left side of the neck was a cyst, which contained a blood clot. Petechiæ on the visceral pleura covering the base of the left lung, which was œdematous on section. A few petechiæ, also, on the visceral pericardium. Right lung firmly adherent by old adhesions which were separated. At the root of the right lung there was an enlarged gland with considerable extravasation of blood around it, and into its substance. Pericardial cavity contained a little clear serum. There was extravasation of blood around the portal vein and bile duct, and the mesenteric glands were enlarged.
12. Jagoo.—Age 30 years. Œdema on chest and upper arms. No enlarged glands externally. Mesenteric glands slightly enlarged and vascular. Middle lobe of right lung solid. Left lung normal. No enlarged bronchial glands.

    NOTE.—In this case no bacilli were found on microscopical examination, but the mother of Jagoo was found, on the same day as Jagoo died, to be suffering from bubonic plague (right axillary).

The following are the detailed *post-mortem* appearances observed in the case of internal bubo with hæmorrhages:—

Musammat Fahiman.—Age 60 years. There was slight puffiness over the right supraclavicular region; general œdema of front and sides of chest and upper arms; on incising the puffy swelling above the clavicle, bloody serum issued, but no gland was seen. On opening the body, petechiæ were seen over the heart, root of lungs, liver, mesenteric kidneys, and parietal peritoneum. The peritoneal cavity contained bloody serum, which in the pelvis and lower part of the abdomen had coagulated into viscid tenacious masses. The portal fissure of the liver was full of blood and disintegrated glands. All the epiploic vessels were engorged with blood, and there was extravasation between the layers of the mesentery. The pelves of the kidneys were choked with blood, the bladder was empty, and there was no trace of bloody urine. The gall bladder was distended, and there were marked petechiæ on its surface. There was a large disintegrated gland in the anterior mediastinum behind the sternum, around which extravasation of blood had taken place, and extended up into the right posterior triangle of the neck; extravasation of blood on the upper surface of the liver around the inferior vena cava, and extending into the coronary ligament. There was extravasation of blood around each intercostal vein and around the azygos vein for about 2 inches of their terminal extremities. The mesenteric glands were prominent. The lungs were healthy, except at the right apex, where old cicatrices were found. Specimens were taken from the liver and glands at the portal fissure, and bacilli were found.

The four cases believed to have died of the septicæmic variety of plague showed the following appearances:—

1. Kanhaya.—Age 11 years. Body emaciated. Œdema over front of chest. Right axilla contained a slightly enlarged red gland. The mesenteric glands were much enlarged, some the size of a filbert, and of deep red colour. All the epiploic vessels were engorged with blood. There was no other pathological change. The microscopical appearances were reported to be suspicious of plague.

2. Mussamat Ghafuran.—Aged 10 years. Œdema of trunk. The fat in the axilla was dark coloured from extravasation of blood, and contained a slightly enlarged gland, deep red on section. Mesentery studded with enlarged red glands. Spleen enlarged and indurated. There was no other pathological change. Microscopical examination failed to show any plague-like organisms. Mr. Hankin, however, obtained rich and abundant cultivations of typical plague bacilli.

9558. (*Dr. Ruffer.*) How long after death?—Within 24 hours.

3. Pusia.—Aged 10 years. There was œdema of the trunk. There was no obviously enlarged external gland. Left femoral glands slightly enlarged and red on section. The mesentery was studded with large and red glands. Specimens taken from mesentery and femoral glands, and from liver, showed abundant bacilli.
4. Mussamat Kalamati.—Aged 10 months. Œdema of chest. Mesentery studded with enlarged red glands. No other visible pathological change. Bacilli were found on microscopic examination by Mr. Hankin and Professor Haffkine.

This child's grandmother was found suffering from plague on the 9th March, and died on the same day. The grandmother had a cervical gland. The child's mother was attacked on the 10th March, had a left inguinal gland, and died on the 12th. Up to the time of her death she suckled this child, the child lying by the mother after the latter's death. The child's brother was attacked by plague on the 12th of March (the same day as the mother died), and he died on the 19th. The child's father was attacked on the 23rd with pneumonic plague, and died the same day. Mussamat Kalamati died on the 28th March. The child had only been noted to be ill in the morning. I had not an opportunity of seeing it. The case was reported to me, but it was dead before I got there. This was 16 days after its mother had died. I thought it quite possible that the child had not died from plague, but from want of maternal care and nourishment. There was another brother still living, and the friends were anxious to remove this brother to Rurki. If the child had not died of plague, of course it was greatly to be wished that the brother should not be detained. If, however, the case was one of plague, it would have been very dangerous to allow the brother to go. I explained this

to the friends, and they asked me to make sure of it by *post-mortem* examination. When I made the *post-mortem* examination I found practically nothing, except the œdema of the front of the chest, that caused me to believe the case to be one of plague, but, microscopically, bacilli were found. A man who, on the death of the father, was put in charge of these two children (he had not been in a contact camp before; he was paid to go there and to look after the children), was attacked on the 2nd of April, and died on the 3rd, I think, with pneumonic plague.

9559. (*Prof. Wright.*) Do you know whether these plague cultures from this series of cases were found to be very virulent?—I cannot say; but the whole history of the family shows that the disease must have been of an extremely virulent type.

9560. (*The President.*) Were these cases all in the same hut?—They were in camp. When the grandmother was attacked they were all removed from the town and put into camp. After each case the hut in which it occurred was burnt, every bit of their property was most thoroughly disinfected by boiling, as far as possible, and other things were soaked with a strong solution of perchloride of mercury. On the death of the father, everything was burnt. Every bit of property was burnt in order to try and save the other children from infection; and yet five days after the father died this infant was attacked with plague. She had none of the family's property left with her, she was given new clothes, everything suspected was removed, and a man who had not been exposed to infection was called in to take care of her, and she, of course, was put into a new hut which had not been previously occupied.

9561. (*Prof. Wright.*) What deduction do you draw from that as to the incubation period of plague?—That it may go up to five days.

9562. Have you any evidence in this series of cases, that the incubation period may be longer than five days?—No; none of these cases would show anything longer than that. The man who took care of the child was attacked on the 2nd of April. The child had been attacked and died on the 28th March. That is five day again.

9563. (*Dr. Ruffer.*) What time did the child die?—The child died on the 28th March. I cannot say what time of day it was. It was towards the evening. It was found to be ill in the morning; and it was dead in the evening.

9564. (*The President.*) Will you now proceed with the details of the six cases of bubonic plague?—The six cases of bubonic plague which were examined more or less completely by *post-mortem* showed the following appearances:—

1. Musammat Jassoo.—Oedema of trunk. Left inguinal bubo. Numerous enlarged mesenteric glands. Lungs healthy. The inguinal glands were not clearly palpable. On incision there were found two enlarged glands of deep purple colour, with only slight infiltration around, and the substance of the gland was not disintegrated.
2. Wazira.—Body fat. Enlarged right inguinal and right femoral gland with violet-purple discolouration of the skin over and around them, and marked blody infiltration of the tissues in which they were embedded. On section the glands and surrounding tissues were plum-coloured. The glands were fairly firm, not disintegrated. On opening the abdomen bloody serum escaped. The mesentery was engorged with blood between its layers from the attached border to within one and a half inches of the intestinal border, and a fringe of apoplectic clots were present along the attached border of the intestine. The appendices epiploicae were all apoplectic right to and including those of the rectum and looked like purple grapes. The general appearance of the mesentery and gut was like a freshly delivered placenta. There were large petechiae in the parietal peritoneum, and small ones on the intestinal peritoneum. Peyer's patches were prominent on the outer surface of the intestines; not ulcerated internally. The thorax was not opened.
3. Farid Bakhsh.—This body was found dead in the town. Whole of face and front of neck completely eaten by animals down to bones, veins of abdominal wall distended, abdomen discoloured from decomposition. Swelling in right axilla with œdema and purple discolouration of the skin. A prominent gland could be seen and felt, and on incision the tissues around were seen to be infiltrated with dark blood and the gland disintegrated. On opening the abdomen all the epiploic veins were seen engorged with blood, and there was extravasation of blood between the layers of the mesentery which likewise contained enlarged glands. The intestines showed patches of injected blood vessels and a few prominent Peyer's patches. There was extravasation of blood at the portal fissure. The kidneys presented no obvious change. On opening the chest the left lung was found œdematous with some serous discoloured fluid in pleural cavity. The right lung was adherent throughout by recent adhesions; its base solid and friable. No enlarged bronchial glands. The pericardium contained a little serous fluid but no lymph.
4. Baijnath.—Age, 11 years. Slight swelling of right side of neck, deeply cauterised. Oedema of chest. An enlarged disintegrated gland found under right sterno-mastoid muscle. Petechiae on peritoneum, gall-bladder, and one on heart. Mesenteric glands prominent and enlarged.
5. Bindoo.—Oedema of chest. Enlarged right axillary gland disintegrated and with bloody infiltration of tissues around. Mesenteric gland enlarged. Small extravasations of blood between the layers of mesentery.
6. Bala Kumhar.—Enormous swelling over right side of chest. Oedema over front of chest and both upper arms. On incising the swelling it was found to be due to extravasated blood surrounding a chain of enlarged disintegrated glands. The mesenteric glands were enlarged and red. There was the mark of cauterisation just above the inner end of right clavicle and on incision a disintegrated gland with bloody infiltration of the tissues around was seen. No other pathological change.

9565. Are those all the *post-mortem* cases?—Those are all.

9566. (*Prof. Wright.*) There was another case?—The case of the Hospital Assistant who recovered. His name was Ibrar Hussain, and he was 30 years of age. Ibrar Hussain was in charge of the Plague Hospital at Kankhal for some months. On the occurrence of plague in Jawalapur he was sent there to assume charge of plague patients. On 17th January, 1898, a man named Jawahir Banniah, died of plague without any external bubo. The body was examined after death. The apex and middle lobe of the right lung were found to be consolidated, right bronchial glands swollen and infiltrated with blood; no pleuritic effusion of serum or lymph. All the mesenteric glands enlarged and vascular, and epiploic vessels engorged. Specimens were taken from bronchial glands, liver, and spleen, and sent for examination to Professors Haffkine and Hankin; the former reported that plague-like bacilli were present, and the latter that typical plague bacilli were seen. During the performance of this *post-mortem* examination, Hospital Assistant Ibrar Hussain scratched the back of his right hand against the cut ends of the ribs of the corpse. He washed the hands thoroughly with water and strong corrosive sublimate solution. On the 18th the scratches had dried up, and Ibrar Hussain had no symptom of ill-health; when seen on the 20th, about mid-day, he was found to have high fever (with a temperature of 104·2) and he stated he had been feverish from the evening of the 19th. The scratches were examined but found to be perfectly healed. A gland under the anterior border of the right axilla appeared to be slightly enlarged and somewhat tender, but this Ibrar Hussain, at the time of examination, denied, although he subsequently admitted that it was not only tender, but painful. At the time of this first examination, the pulse was 152, respiration, 47, the tongue much coated in the centre. The subsequent course of the temperature, pulse, and respiration is shown in the attached chart.* On 21st January the gland was well developed and eventually became as large as a turkey's egg, but never suppurated, and remained enlarged and very hard for more than a month after convalescence was established. Examination of the lungs on the first day of recorded fever failed to elicit anything abnormal. Delirium set in on the evening of 21st, and it was not found

* *See* Appendix No. XXXI. in this Volume.

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possible to examine the back of the chest until 27th (9th day of disease), when well marked tubular breathing and course crepitations were heard over both sides of the chest fastening. It is probable that pneumonia set in on about the fifth day, as on the morning of sixth day, the temperature, pulse, and respiration rose, and when, on the eighth day, the two former were falling, the respirations still remained very frequent and with a normal temperature, on the morning of eleventh day, and pulse of 95, the respirations still kept at 42 per minute. There was no expectoration at any time. The treatment adopted consisted of the freest possible stimulation, cardiac and general, port wine in 2 drachm doses being given in combination with ℥ii Tr. Digitalis every half hour, while "Plague Mixture" (a combination of strychnine, digitalis, and carbolic acid) was given every two hours. Of the Tincture Digitalis as much as 2½ drachms was given during 24 hours for many successive days. Carbolic acid was believed by Captain Scotland, I.M.S., to be of considerable value in the treatment of plague cases. Each dose of the "Plague Mixture" contained ℥i carbolic acid. Nourishment (chicken soup and milk) was administered every hour, day and night. This case is worthy of record, firstly, as being a case of inoculation the incubation period is fairly accurately known: secondly, as showing that the bubo is not necessarily situated in the group of glands directly related to the seat of inoculation; and thirdly, as showing that pneumonia may occur concurrently with or in the course of bubonic plague and recovery follow.

9567. Have you seen any mild cases of plague such as those which are described as *pestis ambulans*?—No, I cannot say I have.

9568. What strikes you as the chief difference between croupous pneumonia and this plague pneumonia? Is it the absence of the inflammation of the pleura?—That is what struck me as a marked difference. We never saw lymph.

9569. It has been suggested that pneumonia regularly occurs in septicæmic cases. Have you seen anything of such secondary pneumonia?—None of the four cases which I have described as being probably of the septicæmic variety showed any pathological changes in the lungs. The case of Ibrar Hussain was, probably, one of pneumonia, secondary to blood-infection and plague adenitis.

9570. Were there in that case any inflamed lymphatics leading up the arm from the scratch?—None at all. I examined carefully the nearer glands, the supra trochlear, and the axillary glands.

8571. Have you in cases of plague seen any local affections of the skin?—Never, except oedema, and discolouration over the seat of buboes, and oedema over the front and sides of the chest, the latter after death.

9572. Are petechiae common?—I never saw them in the skin. They were frequently observed and noticed on internal viscera.

9573. Is there always some ecchymosis over the bubo?—Diffused discolouration I should call it, rather than ecchymosis; the ecchymosis was underneath the skin.

9574. Did you make any bacteriological examinations of the patients during life? Was the bacillus discovered in the sputum?—We did not examine any.

9575. Was the blood examined during life, with a view to the detection of the bacillus?—No.

9576. Did you see any of the monkeys which died in Kankhal?—I saw one monkey in Kankhal which was interesting. It had a left femoral bubo. There was no local lesion to account for it; the bubo was what we called typical; the gland was infiltrated with blood; and its substance was all disintegrated; it was surrounded by a bloody infiltration of the tissues. In the mesentery the glands were enlarged, and there was extravasation of blood between its layers. This was the first case in which I saw such a condition obtain in the mesentery.

9577. Did you observe oedema on the front of the trunk in the monkeys?—In three cases we noted it.

9578. Have you any other cases, in addition to those you have told us of, which bear upon the question of the incubation period of plague?—No, I think not.

9579. Have you seen any reason to suppose that the virus of plague may be conveyed from place to place, independently of the agency of men and rats?—No, none at all.

9580. Did you see those cases in Jawalapur on which Mr. Winter bases the contrary opinion which he holds?—Yes, I did; in fact I drew up the map which showed them originally.

9581. Did your observation leave the impression on your mind that plague can spread out from a centre by some other agency than that of men and rats?—I think more than one explanation occurred to my mind. There is no doubt of the fact that cases did occur on the border of evacuated blocks, but although the explanation of its spreading by the ground is just possible, it seems to me also possible that it might be conveyed by human parasites, for, given an infected area which is evacuated, fleas and bugs would probably migrate to the nearest inhabited houses for a living.

9582. I understand, that if plague were carried solely by agency of men and rats, it would not be likely to spread out from an infected centre in a series of concentric rings. On the other hand, if the plague infection were conveyed outwards by some slow-moving animal, one might naturally expect it to be spread outwards in a series of concentric rings. Are you of opinion that the infection did actually spread outwards in Jawalapur in a series of concentric rings?—Cases occurred upon the margin of an evacuated block, and the houses in which they occurred were fairly concentric with the house in which the original case necessitating evacuation had occurred, inasmuch as the block evacuated extended as near as possible equally in all directions from the originally infected house. Of course, it is quite possible that some of these cases had really lived in the evacuated block, and that the people, when they knew we had found one case, and would evacuate that block, moved a little way away, gauging the area we would evacuate, and going to their friends just beyond it. I think there is no doubt that that did occur in one case, a boy who was subsequently attacked having been removed from an evacuated block before evacuation had taken place. He went to his friends who were living near. There was always a police guard around an evacuated block, so that the cases which occurred in houses adjoining or facing such a block could not be easily removed. We discovered one or two cases in which an attempt was made to remove cases from the town. The people would find greater difficulty on the border of an evacuated block in removing their sick, because there was a police guard on the spot.

9583. (*The President.*) That is the inside border, not the outside border?—The cordon surrounds the evacuated block. The cases occurred, as it were, just outside the cordon, but still within view of the cordon.

9584. (*Mr. Hewett.*) Can you say what the period of incubation was in the case of the woman, referred to by Bishambar Sahai the Assistant Surgeon who is unable to attend?—There is no mention of that in his account which I have here. It simply says that she was removed on the 21st February, caught cold on the 2nd March, and died suddenly during the night.

9585. Is the account intended to convey that she was not subjected to any risk of infection between the 21st and the 2nd?—Presumably so, but I think there is no certainty of that.

9586. Have you formed any idea as to the manner in which plague is communicated from one person to another?—I think the pneumonic cases are the infectious cases. I have never seen any other case except pneumonic cases where anything approaching to infection appeared to exist. Cases in the same family would occur after evacuation, but in the case of a patient who was attended by a person who had not come from the same house in the town I never saw an example of the attendant catching plague from being in attendance. Several cases would occur among those who came from the same house, and were segregated together, but the attendant who had come from another part was never attacked. In the case of the Hospital Assistant, his brother came from Moradabad to look after him. He slept in the same hut with him, nursed him, fed him, and did everything for him and never got plague. In the case of police constables who had not their own friends with them, attendants had to be obtained for them, generally from among other constables, who had not been living in the place where the patient had been attacked, and they never got attacked.

9587. Have you formed any opinion as to the liability of persons of a particular age or sex?—I could give you cases of people of 80 years of age and others of 10 months.

9588. Had you anything to do with disinfection?—Yes, I superintended that.

9589. Did you disinfect the houses of people who were not taken to the segregation camp?—Yes; the butchers' muhalla. They were not evacuated; they were disinfected while the inhabitants were still there.

9590. And they came out of their houses just for the period which was required for disinfection?—Yes.

9591. How long did that take?—It was done very rapidly. We put on several gangs of men, and allowed the people to select the Hospital Assistants whom they liked, Muhammadan Hospital Assistants, to superintend the work, and I suppose they did some 15 or 20 houses a day easily.

9592. The people just went out during the disinfection, and then went back again?—Yes.

9593. (*Dr. Ruffer.*) I should like to have some more exact data about the child who got plague from the father; could you refer to your notes? You say the father died on March 23rd?—Yes.

9594. Was the child isolated after that date?—Yes; I think I mentioned that all the family property was removed, the hut in which the father had lived and died burnt, and the child removed to a new hut.

9595. Was the child isolated or placed in a contact camp where it might have caught plague from somebody else?—It was in a contact camp, but occupied a separate hut.

9596. Were there any cases of plague in that contact camp at the time?—I do not think so, but I would not be sure about it.

9597. The first notice you had about the child being ill was on the 28th?—Yes.

9598. At what time?—I received it about the middle of the day, and I was told the child had fever that morning. I went to see it, and it was dead when I got there.

9599. Do you think that the child's illness lasted only 6 or 7 hours, or that it extended over 24 hours? Would they send information immediately the child was ill?—The Hospital Assistant, of course, saw those in camp every day, and would report at once any sign of illness he observed, but not at night time.

9600. Did you see that child the evening before?—No.

9601. Did the Hospital Assistant see that the child was not ill the evening before?—I am not sure, but had it been observed to be ill, it must have been reported.

9602. So that it was between the 4th and 5th day that the child was actually taken ill?—Yes, between the 4th and 5th day after the father died.

9603. It had been exposed to possible infection in the contact camp?—Of course it had a separate hut, which had not been previously occupied.

9604. The man who was in charge of the child got plague on April 2nd?—Yes.

9605. What time was that noticed?—I cannot tell you that.

9606. You are sure the man was not ill on April 1st?—The record here simply says he got fever on the night of the 2nd with a slight cough; the temperature on the morning of the 3rd was 101.4, and he died on the 3rd.

9607. What is the minimum duration of a case of plague that you have seen?—The father of that child, Hira Chaukidar. I saw him myself one evening, and he was perfectly well as far as I could see: he made no complaint. The next morning I went to the hospital, and he was absolutely prostrate with a great deal of cough and high fever, and he died within two hours of my seeing him, when I was still in the camp.

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9608. The duration would be?—Less than 18 hours.

9609. So that this child, for instance, if it died at noon, was probably ill since the evening before?—Probably.

9610. That would be an incubation period of about four days?—Yes.

9611. You say you have never seen a case of *pestis ambulans*?—No.

9612. I suppose you would not be very likely to see such cases—patients would not come and tell you that they had got *pestis ambulans*?—No.

9613. They are cases which would easily escape notice?—Yes.

9614. (*Mr. Cumine.*) Is the butchers' quarter, which was disinfected but not evacuated, completely isolated from the rest of the town or is it contiguous to the rest of the town?—It is contiguous.

9615. With regard to these disinfecting gangs, what caste are they composed of?—Chiefly Kahars (Hindu dooly bearers).

9616. Only people of pure caste were used in the disinfecting gangs?—In the actual gangs, yes. Of course, sweepers were employed outside the houses, but they were not allowed inside.

9617. Would not the fact that several people from one house got the plague, whereas an attendant on a sick person did not get the plague, look as though there were some common source of infection for all the people in the house, or else that a sick man in a house could only infect another person in the house through some medium such as the floor?—Yes, I think that would appear to be so.

9618. (*Prof. Wright.*) We have had it in evidence that in the opinion of most of our witnesses it would not be possible to discover plague pneumonic cases by corpse inspection; do you think the œdema you described on the sternum would enable one to make a fair guess that the patient had died of plague?—Yes, I think it is important from that point of view.

9619. You think nearly every case of plague could be discovered by corpse inspection?—I think a large number might.

9620. Either by buboes or by the œdema?—Yes, I think so.

9621. (*The President.*) In your *post-mortem* examinations, I suppose the condition of the kidneys was usually observed?—Yes.

9622. Were they generally affected?—No; I think in only two cases we noticed the kidneys were affected.

9623. Have you noticed any cases in the hospital as well?—No; I used to visit the hospital, but I did not have charge of it.

9624. In the bacteriological examination of these cases was the pneumococcus found?—I cannot say. Several specimens were submitted, so that there was an opportunity of examining for pneumococcus as well as for the plague bacillus.

9625. In the case of accidental inoculation you searched for any local signs, did you not, in order to confirm the history of local inoculation, and to determine what changes had taken place?—At the seat of inoculation the scratches were perfectly dry I removed the scabs to search for any trace of pus but there was nothing there; it was absolutely dry.

9626. How long after inoculation did you see the part?—It was on the morning of the 20th when I examined him; he had been inoculated on the 17th.

(Witness withdrew.)

Lieut.-Colonel A. M. CROFTS, I.M.S., called and examined.

Lieut.-Col. A. M. Crofts, I.M.S.

9627. (*The President.*) You are Medical Officer to H.H. the Maharaja Scindia?—Yes.

9628. (*Mr. Hewett.*) I think your experience with regard to plague is confined to Khandraoni, a village in the Gwalior State?—Yes.

9629. Can you give us the total population of that village?—The population, according to the census taken in 1896, was 558.

9630. What is the character of the population?—They are all Hindus, as a rule; there are only five Muhammadans.

9631. Are there any Brahmans among the inhabitants?—Yes.

9632. Are these people in the habit of going to Bombay?—Yes, they were; they were in the habit of going to Bombay for employment, off and on, for some years past.

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9633. When did you get information that there was plague in the village?—On the 16th March 1897 I got information through the Resident at Gwalior.

9634. You then went to the place?—Yes.

9635. You made inquiry as to the sources of infection, did not you?—Yes.

9636. Can you tell us what the result was?—I found that several of the inhabitants of Khandraoni had been in the habit of going to Bombay and taking service there, revisiting their village at intervals, and that amongst these were two Brahmans, Bindraban and Khubi, the former being one of the Lambardars, the Head men of the village.

9637. Can you give us any information as to when these men came back to their village, and in what condition they came back from Bombay?—They went straight from Bombay to Khandraoni, arriving there on the 9th of January. On leaving Bombay, Bindraban was suffering from fever, and Khubi attended him while on the way, bringing him to Jhansi by rail, and from there in a country cart to Khandraoni, where he died five days after his arrival. Two days after Bindraban's death, Khubi fell ill and died three days afterwards. About a week after his death, a native hakim of the village named Nazar Mahomed, who had been treating Bandraban and Khubi, was attacked and died. At the same time, another native hakim named Gopi, who had come in from Karera, a village about 20 miles away, to treat Nazar Mahomed, also succumbed to the disease. Plague then gradually spread amongst the inhabitants of the village, and up to the date of my arrival there had been 59 seizures, of which 47 had proved fatal.

9638. What instructions did you receive as to what you were to do on your arrival at the village?—H.H. the Maharaja instructed me to go to the village, and in the event of plague being present to employ every means, first, to stamp out the disease in the village itself; secondly, to prevent it spreading to any other part of the State; thirdly, to treat the sick; and fourthly, to interfere as little as possible with the harvesting of the crops then in the ground.

9639. What satisfied you that there was plague in village?—On arrival at the village I found there were 11 men suffering from this disease supposed to be plague, and from the symptoms present—buboes, fever, &c.—and the history of the epidemic which I got from the villagers and the Lambardars, and the excessive number of deaths, I concluded that it was plague.

9640. First of all, what establishment did you get to assist you?—When I became clear in my own mind that it was plague, I sent for four companies of the 6th Infantry from Karera.

9641. What was the strength of that force?—224 men; they were weak companies.

9642. What is the number of persons you had to deal with in the village?—The number of inhabitants had decreased from the number of the original census in 1896 to 435 people.

9643. You turned these 435 persons out of the village?—Yes.

9644. How did you divide them?—I divided them into four classes for the purposes of segregation:—viz.

Class I.—Those families who were perfectly healthy and amongst whom no case of plague or fever of any kind had occurred since the 9th of January. It was thought advisable to treat any case of fever as coming under the head of plague, as it was impossible from questioning the villagers themselves, to distinguish, with any certainty, between so-called fever and plague.

Class II.—Those families who were in good health, but amongst whom cases of plague and fever had occurred since the 9th of January.

Class III.—Those families amongst whom there were cases convalescent from plague or fever.

Class IV.—Those families some of whose members were then suffering with plague or fever.

9645. Did you manage to get all these people out of their houses in one day?—Yes.

9646. What date was that?—On the 19th of March.

9647. How did you distribute them?—I distributed them into segregation camps, each camp containing one of the classes which I have named. I wish to lay stress upon the way in which I turned those people out of the village. I took them successively; I did not turn them all out at once. I took each class by itself and turned it out into a distinct segregation camp. It was not necessary to have the segregation camp far from the village, and it was quite close. By that means I was enabled to see that each individual family was absolutely taken out by itself and put under guard and marched off under guard to the segregation camp, and that they were not allowed to take anything which would be liable to carry the infection of plague with them. They were not turned out *en masse*, but individually, as far as regards families, and were taken out under a guard, so that there was no possibility of their taking anything with them into the camp which would carry the infection there.

9648. What was done with their clothes and effects?—Class I., who were perfectly healthy, were allowed to take anything with them they wished. Sentries were then posted on all the infected houses (*i.e.*, of Classes II., III., and IV.), as well as those of Class I. in their immediate vicinity, and strict orders were issued to prevent any persons entering or leaving those houses, or taking any articles therefrom. The remainder of the inhabitants (*i.e.*, Class I., with the exception of those in the immediate vicinity of the other classes) were then turned out of the village and surrounded by a cordon of sentries. This portion of the population was allowed to take any of their property which they wanted with them, no restriction being made. Classes II., III., and IV., as well as those of Class I. living in their immediate vicinity, were then successfully taken out of the village and segregated one from another by a cordon of sentries; those of Class I. hitherto detained being allowed to join the others of the same class previously segregated. These classes and those of Class I., above referred to, were not allowed to take anything out of their houses, except the clothes they were wearing, as much bedding as was absolutely necessary for their protection from the climate, their money, ornaments, and metal cooking utensils. In carrying out this measure I took the precaution of visiting each house in turn, and saw that each family was placed in charge of an escort and conducted straight to the place appointed for their segregation, and that the order regarding the removal of any article, other than those above-mentioned, was strictly adhered to.

9649. I understand these arrangements were all completed as regards all four classes by the end of the day, the 19th of March?—Yes.

9650. What was done to the infected houses?—With the help of a few policemen and chaprasis, hay and other inflammable materials were placed in the infected houses and those in their immediate vicinity, which were then set fire to and destroyed under my personal supervision, care being taken that nothing that could be burnt escaped. A short time after the houses were set fire to it began to blow half a gale, and a good many more houses than was intended were destroyed by fire; but this may be looked upon as an error of Providence, if such can be, on the right side. Every heap of refuse and litter in and round the village was also set fire to, and burned as far as this was possible. The sentries placed over the infected houses were then withdrawn, the cordon round the village still remaining.

9651. What proportion of the houses in the village were left standing after that operation?—I should think probably 10 houses more than I intended were burnt down.

9652. I wanted to get at what number remained, because you subsequently disinfected them?—A house in the village consisted of a dwelling-house and court-yard, in which there were several more houses, varying from five to 10. There were what I might call chambers running round the court-yard, and in the term "house" I include all those chambers and the court-yard.

9653. What proportion of the village was burnt and what was left unburnt?—I should think about one-tenth was burnt.

9654. When you had got these people into camp, how many cases of plague occurred among them, in what camps did they occur, and on what days respectively?—On arrival at the village there were 11 cases existing, and subsequently there were four cases admitted, out of the segregation camp in Class II., those families who were in good health but among whom cases of fever and plague had occurred. One case occurred on

the 22nd, a girl of 14, and the second case on the 27th, the mother of the girl.

9655. Did you have any other cases among the other classes?—Two cases occurred in the hospital camp from Class IV., those families some of whose members were then suffering from plague or fever. One occurred on the 19th, that was the day on which they were turned out, and the other occurred on the 31st March.

9956. When you got to the village were you able to find out about how many cases had been occurring per day in the village before you got there?—It could not be discovered with any amount of certainty. One gets such a garbled account; some people tell you one thing, and others another.

9657. When did you allow them to reoccupy the village?—On the 29th of April.

9658. Before they reoccupied the village did you take any measures with regard to cleansing and disinfecting the houses?—Yes.

9659. Will you describe them?—A number was affixed to every house in the village, and a list of the owners was made, the houses being divided into classes to correspond with those into which the inhabitants had been divided in the first instance, except that Class II. was amalgamated with Class I. The owners of Class I. were then required to clean their own houses, and for this purpose were divided into working parties of not more than ten persons in each, each working party being supplied with phauras, baskets, &c., to clean away dirt and rubbish, and lime, for the purpose of whitewashing the houses inside and outside, and being placed in charge of two sepoys, who were ordered to see that this work was thoroughly and quickly carried out, and that all rubbish was removed to a distance and burnt as far as possible, that the working parties did not enter houses other than their own, and that every evening they marched them outside the chain of sentries posted round the village, and saw that the phauras, baskets, &c., were deposited in the place assigned to them under a guard. Rest from noon to 2 o'clock was allowed, and the work was daily inspected, in order to see that it was properly done. As the people of Classes III. and IV. were still segregated from the rest of the population, and remained so until the camp was finally broken up, working parties were engaged to clean their houses from which their débris was first removed, the floors were then dug up to 1½ feet, the walls were scraped, and both were thoroughly sprayed with disinfectants by means of a fire-engine worked by hand, brought from Gwalior for this purpose. In the meantime the working parties were engaged in cleaning up the village generally, every one employed being paid daily, and the working parties being all under the supervision of sepoys told off for this purpose no slouching was allowed, and the work was carried out systematically and continuously, until I was satisfied that the village was cleaned as far as any Indian village could be.

9660. Will you tell us what disinfectants you used to spray the walls of the houses with?—Permanganate of potash and phenyle were the two disinfectants I used.

9661. Having completed the disinfection and cleansing of the village you let the people go back. Did you disinfect them or clean them before you allowed them to return?—Every man, woman, and child in the hospital segregation camp was compelled to bathe and change the clothes they were wearing to new ones, which were supplied to them free. All the others had practically new clothes, because the State and charitably-disposed people in Gwalior sent out clothes which I distributed among the people of the village, but they were not disinfected in any way, with the exception of those in the hospital segregation camp. The others being perfectly healthy and free from disease at the time, I did not think it necessary.

9662. You treated the 11 cases you found there, and the four people who came into hospital while you were there?—Yes.

9663. Can you tell us how many of them died?—Of the total 15 cases treated four died—26 per cent. of admissions, while the mortality before the formation of the segregation camp was 79 per cent. of the seizures.

9664. That is, of the reported seizures?—Yes.

9665. Did you have any cases of pneumonic plague?—Yes.

9666. How many?—Two after I got there—the girl of 14, and her mother, who caught the plague from her,—both died.

9667. Did you see the bodies of those patients after death?—Yes.

9668. Did you notice any œdema on the chest?—No, I did not.

9669. What measures did you take to prevent the disease spreading to other places?—The whole of the staff of civil officials, the Suba, Tahsildar, chaprasis, &c., were removed from the vicinity of the village, and located near the village of Belloni, nobody except the medical staff and the officers and sepoys engaged on segregation duty being allowed to remain within the boundary limits of Khandraoni village. Nobody, without regard to his rank, business, or occupation, was permitted to enter or leave the segregation camps or cross the village boundary without an order from me, and without being accompanied by one of the Orderly Havildars detailed for this duty at my camp, and orders were issued to the sentries that, under no pretext whatsoever was this rule to be broken; and to make this further certain, entrance to, or exit from, village boundary limits or segregation camps was absolutely prohibited, except at one place appointed for this purpose. Considerable inconvenience, no doubt, arose from this rule, but it was early recognised that its strict observance was of the most vital importance, and it is satisfactory to be able to state that, with one exception, which fortunately was followed by no ill result, but of which due notice was taken, no instance of this rule being broken came to my knowledge, and that the Officer commanding the Troops, the Sir-Suba, and other officials, set a good example by their strict adherence to this rule. The one exception that occurred was a woman who managed to creep past the sentries in the dark from outside. She was an inhabitant of Khandraoni village, and had gone away on some business to another village before segregation measures were taken, and remained away for some time. She wanted to come back to her village, and got past the sentry one dark night, but was promptly discovered on the calling of the roll the next morning. That was the only occasion on which the cordon was broken. A list containing the names of every village within a radius of 10 miles from Khandraoni was made out, these villages were divided into circles of four or five villages each, according to the distance between them, and each circle was placed in charge of a policeman whose duty it was to collect daily reports from the patwaris of each village. The reports were to contain the following information:— (I.) Whether there were any sick in the village, and if so, the nature of their sickness, and (II.) Whether anyone had arrived at, or left, the village since last report, and if so, where they had come from, or gone to. On comparing the census of Khandraoni, taken in July 1896, with the number of people present when the roll was made out, it was seen that there was a considerable decrease in the population, even allowing for the number who had died of plague and other causes during the preceding eight months. A return was, therefore, called for from all villages within 10 miles radius, showing if anyone from Khandraoni had arrived in the village since the beginning of January, and if so, whether they were still there, a list of their names with dates of arrival being also asked for. Inquiry was also made from the inhabitants of Khandraoni itself as to the whereabouts of anyone who had left the village since the arrival of the Brahmans, Bindraban and Khubi, from Bombay. Orders were issued that if there were any persons who had come from Bombay since July 1896, or from Khandraoni since the 1st of January 1897, such persons were to be segregated outside the village until inspected by the Medical Officer. A list was called for giving the names of any of the inhabitants of villages who might then be in Bombay, and orders were issued that their relations in the village should write and tell them that they were prohibited from coming back to the State during the continuance of the plague at Bombay. Orders were issued to the inhabitants of all villages within ten miles round that no person from Khandraoni or Bombay was to be admitted into the village; moreover, they themselves were prohibited from coming to Khandraoni, and they were also told that, except for any very urgent reasons, they were to remain at their own village for at least a month. The villages all round were inspected, those in which there were pople who had come from Khandraoni and Bombay being taken first, and no case of plague was found to be present amongst them. False alarms were at first of frequent occurrence, as the daily reports contained many cases whose symptoms, roughly described by the patwaris,

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might be those of plague; these were inspected without delay, and though doing so entailed many long rides, still there was satisfactory compensation, inasmuch as none of these cases thus inspected, in the majority of instances by myself, proved to be plague. A few cases were inspected by the Assistant Medical Officer who is a qualified medical man. Supplies for the sepoys were brought from outside into their camp, which was pitched about a mile from the village, under escort. The carts were unloaded and the carts and cartmen at once conducted outside village limits. The supplies for the segregation camp were, in a similar manner, brought to the places appointed for the Banniahs, near which no villager was allowed to approach.

9670. Have you had any other cases of plague in the Gwalior State?—A case occurred in Ujain, an imported case.

9671. That is a long way off?—Yes, 300 miles.

9672. This outbreak took place apparently at the beginning of January and you got there in March; how do you account for the fact that plague was not communicated to any of the neighbouring villages in that interval?—There are two villages close by. The people about there are generally stay-at-home people, and they do not travel about the country much. I think that may be one reason. The second reason was that the inhabitants of the surrounding villages took alarm at the enormous mortality which attended the epidemic in Khandraoni, and they protected themselves to a great extent, if not altogether, by preventing communication between their village and Khandraoni. They simply avoided them; they would not have anything to do with them, and they would not go near the village. The natives have a tremendous dread of all cholera or plague, or any epidemic in which there is a great mortality. They will keep away from it as far as they can and will not get into contact with people who are suffering from it. In that way I consider they protected themselves to a large extent, and that may explain why it did not spread among the surrounding villages.

9673. Is it the case that, except these plague deaths which took place while you were there, there were no other deaths in the village during that period?—None whatsoever.

9674. So that you did not resort to corpse inspection except with regard to people who died in the hospital?—That is so.

9675. Was there any mortality among rats in this village?—I saw none.

9676. Did the people mention it?—No.

9677. Were any animals affected by plague?—Not to my knowledge. A cat was found dead, but whether it died of plague or not I cannot say.

9678. You heard Dr. Elphick say that he had not seen a case of *pestis ambulans*. I believe you did see a peculiar case?—Yes, it was that of a child. It was not exactly *pestis ambulans*, because the child could not walk; she was about three months old. She was the daughter of one of the Lambardars in the village in whose house one plague case had died, and another was recovering, when I arrived at the village. Of course the case was convalescent, and the Lambardar and the whole of his family were put into the hospital segregation camp. About a week after this child, who was quite well when we went into the segregation camp, got a bubo in the groin, but there was no fever or consitutional disturbance of any kind whatsoever. The child was perfectly healthy and ate and drank and everything. I was so doubtful about it that it has not been included among the four cases which occurred after my arrival. Still there was no cause whatever which I could assign for the occurrence of this bubo except that it was a case of plague, and it occurred in an infected house amongst people who had had plague and who were then suffering from the plague, and I classified it as *pestis mitior* or *pestis ambulans*.

9679. You took the ordinary precautions which you would have taken if it had been a case of plague?—Exactly, it was in hospital.

9680. (*Dr. Ruffer.*) I see you have stated that "the "microbe once imported by any of certain agencies "into a house where conditions obtained which were "favourable to its development, not alone established "itself in the floors, walls and roof of that house, but "also in or on every article which that house contained"; how do you think the microbe can establish itself all over the house? Is that your opinion now?—No. That is the principle on which I acted, that it did establish itself in that way. I do not say it is correct, but I took that as the basis of operations; it was very early in the plague epidemic, and I really did not know, and could not know, where it established itself, as various opinions were held by authorities on the subject.

9681. I understand you have changed your opinion?—That is so.

9682. In what part of an infected house is the microbe generally located?—I think in the floors and walls.

9683. What makes you think it is chiefly in the floors?—From what I have read about the plague I think the microbe establishes itself mostly in the presence of damp, dirt and darkness; and the floor in most cases presents those characteristics more than any other part of the house.

9684. You said you used permanganate and phenyle for disinfecting houses. Can you tell us the strength which you used?—I used it in different strengths; I did not actually measure any quantity or use any actual strength, for the reason that although I think disinfectants do good, still, I think taking off the roof of a house and burning it, and exposing it to the air and sunlight for weeks is quite sufficient without any disinfectants whatsoever. I simply used the disinfectants on the same principle as I presumed that the microbe could establish itself on the walls of the house and everything that was in the house.

9685. What makes you think that taking the tiles off the roof is sufficient to kill the plague microbe?—I did not say that; I said burning also.

9686. (*Mr. Cumine.*) Disinfection with perchloride takes a much shorter time in any given house than burning, taking off the roof, and exposing it for a long time to sunlight, does it not?—That is so.

9687. (*Prof. Wright.*) Have you any reliable data as to the incubation period, in the case of the Hakim Nazar Mahomed?—I can get absolutely no reliable data from these men. They are simple villagers, and it would be misleading to take their testimony.

9688. How did you manage, by treatment, to reduce your mortality from 80 per cent. to 26 per cent.?—The reason for that reduction was that most of the cases when I got to the village were convalescent, and it was not really so much the result of treatment as that there were many convalescent patients who would have got well in any case.

9689. You mean there were many convalescent patients included among your sick?—Exactly. Eleven cases had been suffering for some time before I got there, and they were sent to the hospital; many of those were really convalescent and required no other treatment.

9690. The measures taken seem very effectual; but may I suggest to you that possibly the epidemic was dying out when you arrived? Can you, with a view to throwing light on that question, tell us the number of cases which died in January, February, and March, respectively? Did you get to your plague village when the epidemic was on the decline or when the epidemic was on the increase? I do not find any data given with respect to that question?—I have not it down, but I know it was not declining, because there were 59 seizures from the middle of January up to the date I arrived, with 47 deaths.

9691. Do you think you could find out how many of these deaths occurred in each week, because I want to make out whether the epidemic was declining or not? Since the epidemic showed no signs of spreading to other villages, is it not possible it might have died out of itself? Are there any data which show that the number of cases was on the increase before you arrived, and that there was a decrease after you arrived? I only want to find out if that is the case or not?—I will try and get the number of cases per week from January down to the time that I arrived in the village. In these villages the information to be got is very unreliable. If I were to ask for it, they would make it up exactly as they thought I wanted it.

9692. (*Dr. Ruffer.*) I see you had 244 soldiers?—Yes, I had to get another regiment up afterwards.

9693. There were 435 people in the village?—Yes, but I had to arrange to cut the crops, and the village lands extended over an area of five miles.

9694. How many men did you have altogether?—456 sepoys. This was because I had to have men to cut the crops.

9695. You do not think you could have done with less?—No, I certainly could not.

9696. Is not there a record, week by week, of the deaths?—There ought to be, but they were in a state of panic. I do not think you would get a return which would be of the least possible use, because the information obtained from these people is very unreliable.

(The following letter was subsequently received from witness:—

"Lashkar, Gwalior,
"21st March, 1899.

"Sir—I have the honour to forward herewith a list of persons who were attacked with plague at Khandraoni, in original, as received from the Patwari of the village, and also a translation of the same for easy reference. It will be observed that there is a few days difference in the dates of attack or death as compared with those given in my evidence, but this is due to the difficulty of exactly finding out the English dates which correspond with the Mahratti dates. In my report on the epidemic of plague at Khandraoni, owing to this uncertainty, I also quoted in brackets the Mahratti date on which Bindraban and Khubi arrived at Khandraoni (*i.e.*, three days before 'Magar Sankrant,' in the month of 'Poos').

TRANSLATION of the LIST showing the PERSONS attacked with PLAGUE at KHANDRONI, PERGANNA KARERA, ZILA PICHHORE in 1897.

Month and Date.	No.	Names of Persons.	Month and Date.	No.	Names of Persons.
1897.			1897.		
January 18	1	Bindraban, Lambardar.	March 1	29	Dewa, Brahman.
„ 23	2	Khubi, Brahman.	„ 2	30	Maharaun, Brahman.
„ 29	3	Salku, Brahman.	„ 3	31	Arjan.
„ 29	4	Bhawani, Brahman.	„ 3	32	Parichhat.
„ 29	5	Wife of Salku.	„ 3	33	Sona.
„ 29	6	Daughter of Salku.	„ 3	34	Dulaj.
„ 29	7	Wife of Bhawani.	„ 3	35	Wife of Bindraban.
„ 29	8	Son of Bhawani.	„ 4	36	Gori, Brahman.
„ 29	9	Nazar Mahomed.	„ 4	37	Kasi, Brahman.
„ 29	10	Wawalin, Brahman.	„ 5	38	Dabjawari, Brahman.
„ 31	11	Kanai, Brahman.	„ 8	39	Kudelwari, Brahman.
„ 31	12	Sakhunia, Brahman.	„ 9	40	Ladli, Wanan.
February 3	13	Daughter of Wanani.	„ 11	41	Thanerawari, Wanan.
„ 3	14	Bilariwari Gadan.	„ 12	42	Wife of Heeralal.
„ 6	15	Bilbary, Pande.	„ 13	43	Mohnia, Kayasth.
„ 6	16	Bhike, Pande.	„ 14	44	Hallaiwari, Brahman.
„ 9	17	Beju, Goldsmith.	„ 15	45	Saloni, Wanan.
„ 9	18	Bhupawani.	„ 15	46	Saloni, Tiwaran.
„ 10	19	Chukhara, Barber.	„ 16	47	Bhawani, Brahman of Kheri.
„ 19	20	Saloni, Brahman.	„ 16	48	Gopi, Brahman of Karer.
„ 20	21	Noni Bahoo, Brahman.	„ 16	49	Dhoka, Brahman.
„ 22	22	Bhura, Brahman.	„ 17	50	Rajram, Brahman.
„ 23	23	Chandpurwari, Brahman.	„ 17	51	Chunia, Rawat.
„ 24	24	Murlidher, Brahman.	„ 21	52	Sobharam.
„ 25	25	Phulsing, Brahman.	„ 21	53	Karerawari.
„ 26	26	Wari Bahoo, Brahman.	„ 27	54	Goriya, Brahman.
„ 27	27	Mayawari.	„ 30	55	Kosa, Brahman.
„ 28	28	Hiro, Brahman.	April 7	56	Sarusatia Lohar, blacksmith.)

9697. (*The President.*) Perhaps you can tell us your general impression?—My general impression from what I could learn myself on the spot, was that the plague was going on about the same for about three weeks before my arrival. In the preceeding three weeks there was an average of about five or six deaths per week, and it was in no way decreasing during the last week. In fact, the reason it came to notice at all, and that it was reported, was that it was increasing so much that tidings reached Jhansi, not through the State, but through the Deputy Commissioner of Jhansi, that the epidemic was increasing very badly. If it had been decreasing they would never have reported the matter at all. The virulence was becoming so severe that news of it filtered through the Deputy Commissioner at Jhansi, although the officials of the Gwalior State themselves neglected to report the matter to the Darbar. It had come to such a pitch at the time of this report that it could not be stifled, and information absolutely travelled through the Deputy Commissioner of Jhansi to the Government of the North-West Provinces, from them to the Government of India, and thence back again to the Gwalior State.

9698. (*Mr. Hewett.*) Could you get the original report that went in from the Sub-Inspector of Police to the Deputy Commissioner of Jhansi, because that would show what the mortality had been?—If you get that it would be exaggerated even still more.

[A copy of the report referred to was obtained from the Government of the North West Provinces and is as follows:—

(Witness withdrew.)

Translation of the original report by the Sub-Inspector of Police, Jhansi, dated 14th March 1897:—

"I beg to report that, in the course of a talk regarding the bubonic plague which has long been raging in Bombay, &c., I have come to know that a certain Brahman of Khandráoni village, Thana Dinárá, Gwalior State, was employed in Bombay, and that he, as well as all the other members of his family, died of the said disease in the said village. Besides these many other persons of the said village have died, and the situation still remains unchanged. This village is situated at a distance of 1 kos from Oudh Ganwá, Police Circle Dinárá, and at a distance of 4 kos from Thána Raksa, and the Bakkals (traders) of Khandraoni village daily come to the Jhansi Bazar to sell ghi, &c. But as this intelligence is rather indirect, not being based on the statement of an eye-witness, a formal letter has been addressed to the officer in charge of the Police Station, Dinárá, Gwalior State, asking him to say if the said news is true. The whole matter will become clear when a reply has been received from the said officer. I beg to report this for your information. In the event of the bubonic plague really existing in the said village, the Sub-Inspector of Dinárá has also been asked to tell the names of the persons who daily visit Jhansi, as well as to ascertain from the Bakkals trading in ghi, the names of those Bakkals residing in Jhansi at whose shops (the former* sell their ghi).

"Dated the 14th March 1897.

"(Signed) BADRUDDIN,
"Sub-Inspector of Police Station,
"New Jhansi,
"from Manza Rawpura."

* The words in brackets have been substituted from guess, the sentence in the vernacular copy being left incomplete.

A. GHAFUR,
District Superintendent of Police, Jhansi.

Lieut.-Col. A. Adams, I.M.S.

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Lieutenant-Colonel A. ADAMS, I.M.S., called and examined.

9699. (*The President.*) You are the Administrative Medical Officer in Rajuptana?—Yes.

9700. And you have had experience of plague in Sirohi State?—Yes.

9701. And you think you are able to draw certain deductions from what you have seen?—Yes.

9702. First, what can you tell us with regard to the source of infection?—It was from a Banniah from Poona. He came into the village and nothing was done, and we afterwards found an outbreak of plague. They had a big funeral feast there. It was discovered on the 22nd of November, 1897. There had been 17 deaths in four villages at that time.

9703. You say this man had come from Poona; how far is Poona from this village?—A good many hundred miles.

9704. How many days' journey do you think?—About three days' journey.

9705. He died on the following day?—Yes. Of course we had to rely on the villagers for the information. We found that there had been a considerable mortality about that time, about the 27th November, and there were some cases afterwards. There were 17 deaths before that, and nine deaths afterwards.

9706. He died on the 27th November?—He must have died a few days before that; we could not find out the exact date.

9707. Some days before that there were a good many deaths?—Yes.

9708. How do you know that the increased mortality was due to plague?—The mortality was great.

9709. How do you know that this man introduced the plague; cases had occurred before, had they not?—No other cases had occurred before that. This man died the day after his arrival with plague; at least the people believed it was plague; there was no doctor in the village. Then, I made out that 17 deaths had occurred subsequently.

9710. In what villages?—In the villages of Teuri, Sheudial, Wardra, and Sanpur; they are about two miles apart.

9711. What steps did you take?—We had the infected people taken out of the villages and put into camps, and we kept them out there for some time. There were nine cases after they left.

9712. What did you do with the houses?—We left the houses empty, and had them lime-washed with some perchloride of mercury added. We did not mix them together. We put perchloride of mercury on the floors and then lime-washed the walls.

9713. Notwithstanding that, there was a recrudescence?—On the 2nd January, the first case of recrudescence was reported.

9714. How many cases occurred on the second occasion, in the recrudescence?—There were four cases, I think.

9715. What did you do then to stop the further progress of the disease?—We put the people out into camp again and kept them out a long time; we unroofed the houses and kept them unroofed for a long time. The people did not go back till April.

9716. Were the houses disinfected in the same manner as they had been disinfected the first time?—They were more thoroughly done the second time. We had better arrangements and, of course, the houses had been unroofed for a long time.

9717. What was the difference in the disinfection on the second occasion?—We had more supervision; it was more thoroughly done.

9718. You think also that rats are able to communicate the disease?—Yes. We found that just at the end of the epidemic some people died who had been working near a well, and we attributed that to rats. The people had cut the wheat, and were winnowing it at this well.

9719. There was an infected village near the well?—Yes, Kalindri, where the plague had remained longer than in other villages.

9720. Were there plague cases at that time?—No.

9721. When was the last previous case?—There had not been one for three weeks before.

9722. Then with regard to the rats?—I think the rats must have carried the infection; there was no other way of accounting for it. These people were very particular to avoid other sources of infection from houses; they had lime-washed their houses like the other people, and no cases had occurred previously in those houses.

9723. Had they had any communication with the people in the village itself?—The people were out of the village at this time.

9724. What is the evidence of the rats migrating?—Some dead rats were found in this grain and three people died suddenly in one family. Three others of the same family were attacked afterwards, one of whom recovered.

9725. Do you think the infective material has great vitality?—Yes, I think it remains a long time in the houses, especially badly ventilated houses.

9726. What evidence have you of that?—We did not take off the roofs before the recrudescence, and it remained in the village.

9727. You did not take off roofs, neither did you disinfect, in a manner satisfactory to yourself?—It is difficult to disinfect one of these villages thoroughly. It was not done under the same supervision as at the second time, because we had not available supervision. We allowed the villagers to do it.

9728. What do you advise in the way of prevention of plague?—I think that without observation camps you cannot keep it out of a place very well. We have had camps in Rajputana for a couple of years, and kept it out very well.

9729. And you have inspection stations also?—Yes. We had 38 imported cases on the line and 30 deaths.

9730. You inspected those cases?—Yes.

9731. Will you explain the arrangements you adopted?—The third class passengers who came from infected areas were detained for five days. They are nearly all third class passengers in these places. At first we detained them for 10 days when the plague was nearer, but the plague is a great deal further away from our border now.

9732. By that means you were able to intercept how many cases?—38, 30 of whom died.

9733. How many people did you inspect altogether?—Thousands of people; we have not a record of the number.

9734. You restricted yourself to the third class passengers?—We did not stop Europeans nor those whom we could watch. Some of those passengers we could observe, and we did not detain them, but there was no other means of observation in some of these Native States. There are no police arrangements that can be trusted to do this.

9735. In addition to these observation camps, what other measures did you adopt?—We kept them in the sun and allowed them to disinfect their bedding and clothing and everything like that in the sun.

9736. Whom do you mean?—The passengers whom we detained. Then we allowed them to go to the villages where they wished to go after the period we thought necessary for observation.

9737. When you actually had plague in a town or village, upon what measures did you place the greatest reliance?—In preventing the spread of disease we relied on cordons of police and sepoys. We kept the people of the five infected villages at their villages; we did not allow them to run away. There is a great tendency for them to run away from one village to another as soon as plague breaks out. We prevented that.

9738. You kept them in their villages?—We kept them in camps near the villages, and evacuated the villages.

9739. Do you think there is a great difficulty in employing chemical disinfectants?—Yes; there is a difficulty in disinfecting a village in a Native State. We have not trained hands or anything like that. Of course it is very difficult in a village, where the cattle and other animals are often inside the dwelling-houses, to disinfect it thoroughly unless you burn it down.

9740. You refer, in your précis of evidence, to the difficulty of the objection of the people?—The people

object to chemicals. A great many Hindus strongly object to chemicals.

9741. But that objection you were able to overcome?—We did not overcome it under all circumstances. They have a decided objection to it. A great many of them would much rather remain in one of the camps for a while.

9742. Did you not disinfect the houses they had vacated after they went into camp?—They did not come from the houses, they came from infected districts and were trying to get into our States; they had family connexions with the villagers of these States.

9743. In the case of villagers in your own district who had been affected, did you have much difficulty?—We burnt everything when the patient died.

9744. With regard to the houses, had you any difficulty in disinfecting them?—No; they did not make any objection to that.

9745. It is the disinfection of the persons you mean?—Yes.

9746. (*Mr. Hewett.*) Can you tell us where your railway inspection stations were?—They were all along the line from Abu Road, which was the first, up to Bandikui, and also on the railway which runs through Ulwar and Bhartpur.

9747. You detained everyone from the infected area, whether he showed suspicious symptoms or not?—Yes.

9748. Was that in accordance with the orders of the Government of India?—The Native States wished it done themselves.

9749. Are you acting under the orders of the Government of India or the Native States?—I do not think there is any distinct order about it from the Government of India with regard to Native States.

9750. There is a general order as to what should be done in British India?—I do not think that is extended to Native States.

9751. Would not the same policy obtain everywhere?—No orders were issued to the Darbars.

9752. You are aware that these orders were in force in British India?—Yes.

9753. Still, you thought it necessary to stop everybody, whether suspicious or not?—We did not stop everybody.

9754. All third class passengers?—Only those who were suspicious. Those we considered suspicious were those who came from an infected area—the people running away, for instance, from infected areas.

9755. But you stopped everybody from the infected area, whether they were suspicious or not?—We considered them suspicious if they had come from an infected area.

9756. Was that the interpretation which the Government of India placed upon the word "suspicious" elsewhere?—That is the interpretation the Native States put upon it.

9757. Was that the interpretation put upon it by the Government of India?—I think there is a great deal of latitude given.

9758. Can you tell us what the maximum number of persons you collected in one of those observation camps was?—We had several hundreds in some of them.

9759. For how many days?—At first for 10 days, and afterwards for five days.

9760. Did cases of plague break out in these camps?—Cases developed shortly after arrival in camp, within 10 days.

9761. Did the cases of plague which you found develop in the camps which contained 600 or 700 people?—Some of them did.

9762. Was not that calculated to make plague break out in the Native States?—No; we separated them as soon as we detected them, and we had Hospital Assistants watching those camps.

9763. You do not think there is any danger to the Native States in putting travellers into camp in this way?—We had no indigenous cases. We burnt everything as soon as we detected a case. New arrivals were separated from the others; we gave considerable attention to that.

9764. When the plague broke out originally in Rajputana, did it break out among the Banniahs?—Yes they were Banniahs at first—the 26 who first died.

9765. In the recrudescence among what classes did it break out?—It went to the Chamars and Rajputs and different classes.

9766. How many cases were there in the recrudescence?—Before the recrudescence there were 26 cases, and altogether there were 166 cases, 23 of which recovered.

9767. In the recrudescence did any cases occur in the houses in which plague had occurred in the original outbreak?—No, in other houses.

9768. All in different houses?—Yes.

9769. And among a different class of people?—Yes. The infected were kept out longer than the others.

9770. You let back the people who were not infected into the houses?—Yes, we let them back earlier. When the weather was cold we had some difficulty in keeping them out. We did not let them occupy houses where cases had occurred.

9771. During the absence of people in camp, would it appear that infection had proceeded from one part of the village to another?—I think so. It seems to have spread to other houses.

9772. Was that the case in each village of which you had experience?—Yes; it extended to other houses while the people were out in camp. It must have extended to other houses when they were unoccupied, I think.

9773. When you had evacuated a village you had a cordon of police to prevent the people getting back into it?—Yes.

9774. Do you think that your cordon of sepoys was sufficient to make it certain that people did not go to the village?—Yes, with the assistance of the villagers.

9775. Do you think it is certain that the people did not get back?—They did not sleep in the village; they went back in the daytime to get grain and food, and things of that sort. We allowed them to do that, but we sent an escort of sepoys with them.

9776. Then infected people may have got into the village from the camp?—It was unlikely, I think, that the infected people went back again.

9777. Their clothes may have been infected?—Yes.

9778. Did you resort to corpse inspection at all?—No.

9779. Do you think that it would be feasible in Rajputana?—Not among the Muhammadans; I think it would be quite impossible in large towns like Ajmere, for instance.

9780. Do you think that the Muhammadans would object generally or only in large towns?—I think generally, but more in a place like Ajmere.

9781. Had you any cases of pneumonic plague?—We supposed all those that died suddenly after the first outbreak were pneumonic.

9782. Did you see any of the bodies?—No, I did not see any of the bodies after they died. I had not anything to do with that part of it.

9783. I suppose Captain Grant will be able to tell us about that?—Yes.

9784. (*Mr. Cumine.*) You say, I think, that rats migrated from the village of Kalindri, and that it was probably through the migration of rats that Kalindri itself had become infected?—Yes; the rats seemed to have left the other villages which were first attacked, and we think they left them when the outbreak first occurred.

9785. You say, I think, that dead rats were found amongst some grain. Now is there any evidence that the rats had gone to that grain, and that they were not there originally?—The grain had not been long there. They were winnowing the grain at the time, it had been cut while they were living at the well. When I saw the grain it was in a great heap and the people had then been attacked. Three of them died suddenly. We did not hear of it until they died. The other three we saw. One of them recovered. We attributed this to rats having got into the grain, because dead rats had been found there.

9786. Before you saw the dead rats three people had died in the place?—Yes, suddenly, but dead rats were

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seen by the villagers before those three sudden deaths occurred. They admitted that afterwards.

9787. Before the three people were attacked?—Before the deaths occurred. They died very suddenly; it must have been very acute, because we had been watching these places and had not got any information. We got information when the other three people were ill. Six people were attacked altogether, three of whom died very suddenly.

9788. There seems a little uncertainty as to the village into which the wealthy Banniah, from Poona, came?—He went to Teuri; there is no uncertainty about that. That was almost in the centre of the infected area.

9789. When the disease was discovered on the 27th November, were all the villages completely evacuated?—No; the sick were put out first and the other people were told to get out as quickly as they could, and make arrangements for themselves. It took about three days, I think.

9790. Before the villages were completely evacuated?—Yes, but the sick were all out the first day in the evening. I passed through the next morning and saw they were all out, and the Hospital Assistants were in charge of them.

9791. Do you know how many cases occurred in the village before the disease was discovered?—Before the disease was discovered, I think, there were 17 out of 26. That is all I could find.

9792. How many people were ill when the village was evacuated the first time?—There were two ill the next day; there were none ill at the time.

9793. And within ten days after the first evacuation how many people were attacked besides those two?—Seven others, and they all died.

9794. (*Prof. Wright.*) Were you able to make out whether the Banniah, who started your epidemic, had pneumonic plague or not?—He was supposed to have had pneumonic plague, but of course I had not seen him. He died very suddenly. The villagers said it was plague. They had known of the Pali plague in 1836.

9795. Is it your opinion that the clothes are infected when they are not soiled by the excretions of a person suffering from plague?—They may have sputum or something like that on them.

9796. You speak of outbreaks in three or four villages after the distribution of the clothes of the Banniah?—People attended the funeral feast.

9797. In view of the fact that the Banniah cannot have contaminated many by his clothes, do you not think the people who attended the funeral may have contaminated themselves at the house?—The man's clothes were not burnt, but were distributed.

9798. A man cannot contaminate many of his clothes, I suppose?—No, but those people attended the funeral feast, and they all slept together probably, and stayed there for a day or two. The man's relations had money to spend on them.

9799. (*The President.*) Your opinion is that they might have been personally infected?—Yes.

9800. And already suffering from the disease?—Yes. They might possibly have been directly infected.

9801. The clothes, perhaps, had absolutely nothing to do with it?—They may not have had anything to do with it.

9802. (*Mr. Hewett.*) You mean that the practice of distributing the clothes of a rich man after death is calculated, if he has died of plague, to distribute the plague?—Yes, they might.

9803. Have you tried inoculation at all?—No, we had no opportunity. We thought of trying it at the last, but the people were averse to any remedy. It is an out-of-the-way district.

9804. You found them very much averse from any treatment at all?—Yes, they did not like us to touch them at all; they had an idea that we wanted to poison them in order to stamp out the epidemic.

9805. They had a strong objection to being touched by a European?—Yes.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Metcalfe Hall, Agra.

TWENTY-EIGHTH DAY.

Saturday, 14th January 1899.

MR. J. P. HEWETT in the Chair.

Mr. A. CUMINE. | Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Captain J. W. GRANT, I.M.S., called and examined.

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9806. (*The Chairman.*) You are in the Indian Medical Service?—Yes.

9807. And were specially employed in the plague outbreak in the Sirohi State?—Yes.

9808. Can you tell us when you joined your appointment there?—On the 4th January 1898.

9809. You were not employed during the first outbreak there?—No.

9810. Will you tell us the villages in which plague broke out during the recrudescence, and the dates in each village?—The four villages attacked in the recrudescence were Kalindri, Sheudial, Teuri, and Wardra. In Kalindri the first case was on the 1st January, in

Teuri the 1st January, in Sheudial the 6th January, and when I went to Wardra on the 4th January I found one case and one only. This is shown in the following table :—

Villages infected in November 1897.	Caste infected in November 1897.	Date of Recrudescence.	Castes attacked in first two Days of Recrudescence.	Villages entirely vacated.	Population.	Number of Attacks.	Percentage of Population attacked.	Percentage of Mortality among Population.	Percentage of Mortality among attacked.	Date of last Attack.	Remarks.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Kalindri - -	Banniah	1/1/98	2 Banniahs - 1 Brahman -	20/1/98	4,000	84	2·10	1·72	82·14	12/4/98	Ceased to be epidemic on 16th March. Sporadic cases on 6th and 12th April.
Sheudial - -	Do.	6/1/98	3 Chamars - 1 Banniah -	11/1/98	1,200	22	1·83	1·58	86·36	2/2/98	
Teuri - - -	Do.	1/1/98	1 Banniah -	11/1/98	1,800	26	1·44	1·22	84·61	31/1/98	
Wardra - -	Do.	3/1/98*	1 Sutar - 3 Banniahs -	21/1/98	400	8	2·00	1·75	87·50	25/1/98	Confined to two families attacked on 21st January 1898.

* In Wardra, one Mali was attacked on 3rd January 1898. The patient was segregated, and, as the disease did not then spread, evacuation was considered unnecessary. Practically the recrudescence commenced on 21st January.

9811. I understand that there was a village which was not re-infected. Can you give us the name of that village?—Sanpur.

9812. You have put down Kalindri, in column 2 of the statement you put in, as having been infected in November 1897. Was that the case?—I understand that was not the case. There were five cases before I went there.

9813. But no measures were taken in Kalindri before you went there?—I found the plague patients in huts outside the village.

9814. In the case of this village of Wardra, did you isolate the single patient you found on the 3rd January?—He and his family were moved out into a hut.

9815. And you took no further measures?—We disinfected his house and watched the village.

9816. No further cases were found till the 21st?—That is so.

9817. Among what classes did you find the recrudescence in the different villages?—In Kalindri on the first two days there were two Banniahs and one Brahman; in Sheudial, three Chamars and one Banniah; in Teuri, one Banniah; in Wardra, on the 21st, there were one Sutar and three Banniahs.

9818. Were any of these attacks among the people who had been segregated in the first instance?—No.

9819. Did any of them occur in houses which were previously attacked?—No.

9820. Were they in the same portion of the village as the first attacks?—In Teuri they were, but in Sheudial they were in quite a different part of the village.

9821. What measures did you take?—At first we tried moving only the infected families out.

9822. During the recrudescence?—During the first few days of the recrudescence, but as the disease continued to spread and other families became attacked, we decided upon moving the whole village out into camp.

9823. Will you give us the dates on which you moved out the various villages?—Kalindri, 20th January; Sheudial, 11th January; Teuri, 11th January; Wardra, 21st January.

9824. Then you got the people of Wardra out on the day that you considered there was a recrudescence?—Yes.

9825. How many cases had there been in Wardra?—Four, in addition to the one case on the 3rd of January.

9826. And how many were there after you got the people into camp?—Three.

9827. What was the date of the last case which occurred in the camp?—Four days later, the 25th January.

9828. After that you had no more cases?—That is so.

9829. How many people were there in camp at Wardra?—400.

9830. In Kalindri you had a population of 4,000 to deal with?—Yes.

9831. Did you get them all into camp?—Yes, but it took five days. They were ordered into camp on the 15th, and were all out on the 20th.

9832. By the 20th how many cases of plague had occurred in that village?—18 cases.

9833. Before you got them into camp?—Yes.

9834. How many cases were there after you got them into camp?—66 in Kalindri.

9835. Can you give the dates of the different cases that occurred after you got them into camp?—They went on for three months.

9836. We should like to know how they began?—In Kalindra there were—

3	cases on the	20th of January.
1	,,	21st ,,
2	,,	22nd ,,
1	,,	23rd ,,
3	,,	24th ,,
1	,,	25th ,,
2	,,	26th ,,
2	,,	27th ,,
2	,,	28th ,,
2	,,	29th ,,
2	,,	30th ,,
Total 20	to end of	January.
3	cases on the	2nd of February.
2	,,	3rd ,,
2	,,	4th ,,
1	,,	5th ,,
1	,,	6th ,,
1	,,	7th ,,
2	,,	8th ,,
1	,,	9th ,,
1	,,	10th ,,
1	,,	11th ,,
1	,,	14th ,,
1	,,	15th ,,
3	,,	17th ,,
2	,,	18th ,,
2	,,	20th ,,

and so on.

9837. How long did the outbreak last?—On the 26th February there were four cases.

9838. Were they the last?—No. After that there was an interval till the 4th March. In March there were eight cases.

9839. Were the cases which occurred on and after the 2nd February among the people who had been having cases up to the end of January or not?—There was another caste infected in February.

9840. Did that occur in a separate camp?—Yes. They had had no cases before the recrudescence.

9841. How many families were there in that camp?—About 80.

9842. What caste were they?—Porwai Banniahs.

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9843. How far was their camp from the village?—About 100 yards.

9844. Do you feel certain that these people had had no access to the village in the interval?—There was a guard round the village.

9845. But the people were very close to the village, and they got the infection when there was no plague among them. Do you think that it is improbable that they got into the village?—I think it is improbable.

9846. Do you think that it is impossible?—I could not say that.

9847. Was there any other camp of Banniahs which got infected at the same time?—There were two classes of Banniahs, Oswals, and Porwals; the Oswals were the first infected.

9848. When did they get infected?—On the 1st January.

9849. Did any cases occur among the Oswal Banniahs at the same time that the Porwal Banniahs got infected?—Plague was going on at the same time, but they were 400 yards away—in another camp.

9850. Was it in these two camps that the disease went on till the 4th of March?—No, it was among the field-workers.

9851. When did the plague break out among them?—In January. There was some infection among them before they went into camps, and it continued right on.

9852. Did you feel certain that none of them got into the village?—There were none in the village at night. I used to go into the village at night.

9853. They were allowed to work in the fields?—Yes.

9854. And, therefore they got out of the camp?—The camp was at the wells. They took their goods with them to the wells, and built huts there.

9855. During the daytime they were under observation?—Not under strict observation. They were watched during the day.

9856. As they were not under strict observation, it is possible that they may have got into the village?—It is possible, but extremely improbable. There was a guard round the village.

9857. How many men composed that guard?—About 20, I think.

9858. The village contained 4,000 inhabitants?—Yes.

9859. There was a sporadic outbreak later on, was there not?—Yes, in April.

9860. What people were attacked?—The Brahmans, who were about half a mile from the village. There had been no cases there before, nor in the immediate neighbourhood.

9861. How many cases took place there?—Six.

9862. Before you put the people of Sheudial into camp, how many cases had taken place?—Nine cases.

9863. And you took 1,200 people into camp?—Yes.

9864. How many cases took place subsequently to their going into camp?—13.

9865. Can you give us the dates on which they took place?—

13th	January,	1	case.
14th	,,	1	,,
15th	,,	1	,,
16th	,,	1	,,
20th	,,	1	,,
21st	,,	1	,,
28th	,,	4	,,
29th	,,	1	,,
31st	,,	1	,,
2nd	February	1	,,
Total	-	13	,,

9866. Was the 2nd February the date of the last case?—Yes.

9867. How many camps had you?—The Banniahs had one camp, the Chamars, a low caste people, had one camp, and the field-workers went to the wells.

9868. In what caste was the majority of these cases?—The Chamars were the most most heavily attacked at Sheudial, and next to them the Banniahs.

9869. There was an interval between the 16th and the 20th January. Were the cases on those days in the same camp?—The case on the 16th was a Banniah, and the case on the 20th was a Chamar.

9870. In the other camp?—Yes.

9871. What was the latest case prior to the 20th in that camp?—Among the Chamars, the 14th.

9872. In which camp were the cases which occurred on the 28th?—Two Rahbaris and two Chamars, the former in the field-workers' camp at the wells.

9873. How many cases were there at Teuri before you got the people into camp?—Six.

9874. How many afterwards?—20.

9875. How many camps had you there among those 1,800 people?—The same as at Sheudial.

9876. Could you give us the attacks which took place, camp by camp?—Yes, but it would take some time. I have the four villages in one list.

9877. Can you give us the dates on which the attacks took place, after you got the people into camp?—

14th	January,	2	cases.
15th	,,	1	,,
16th	,,	2	,,
17th	,,	2	,,
18th	,,	3	,,
19th	,,	5	,,
20th	,,	1	,,
25th	,,	1	,,
27th	,,	2	,,
31st	,,	1	,,
Total	-	20	,,

9878. Were there any attacks among the attendants on the sick?—Very few. There were eight altogether.

9879. How many officials and police had you employed on the place?—When the villages were evacuated there were only about 20, but that number was increased within a few days to 140.

9880. Did you have any attacks among them?—Two.

9881. Could you give us any details about those two attacks?—The first case was a sawar. On the 11th January he rode out with me from Kalindri, where I had my headquarters, to Teuri. He fell from his horse in that village, and was seized with a convulsive attack. In the evening he was able to ride back to Kalindri. Next morning he had a large bubo in the left groin, and died the same afternoon. He had been living in a house in the outskirts of the village with six policemen and two other sawars (who carried his corpse to the burning ground). They all took their food together, and, so far as could be seen, were equally exposed to infection.

9882. The others were not infected?—No.

9883. What was the other case?—That occurred on the 18th February in one of the cordon of police around Kalindri. His duty did not require him and he was not known to have entered the village. His hut was at once burnt down, and the five men who lived with him escaped infection.

9884. Did the people object to being medically treated?—They did.

9885. They objected to your having anything to do with them?—They objected to our touching them.

9886. Out of the number you had under your charge, how many died and how many recovered?—There were 140 cases, and 117 died.

9887. Did a number of them die very rapidly?—83 cases died within 48 hours.

9888. Was the type of plague mainly bubonic or pneumonic?—There were about 25 cases of pneumonic plague.

9889. Did you see the bodies of the people who died of pneumonic plague?—Those I had seen before death I did not examine; the people did not like us to touch the bodies after death.

9890. Did you see any bodies of those who had died of pneumonic plague?—I did see some.

9891. Did you notice œdema on the chest?—No, I did not notice it. I did not look for it; I was satisfied they were cases of plague.

9892. I suppose none of these cases were bacteriologically examined?—No, none of them.

9893. What did you do in the way of disinfection?—At first, the family, who were sent to the contact camp, had their clothes disinfected with perchloride of mercury solution. Some cases followed, and the people said they had been poisoned and had died on account of that. Then that disinfection was given up, all the old rags were burnt, and the rest of the clothes exposed to the sun.

9894. What did you do with regard to the disinfection of the houses?—They were left unoccupied until the hot weather set in; then the roofs were taken off, and the floors were first disinfected with perchloride of mercury solution and then dug up, put outside, and burnt. That was done in houses in which cases were known to have occurred, and, before being re-occupied, the whole village was limewashed, and every house partly unroofed to let in sunlight and air.

9895. Did you find any fear of the plague among the people?—Very great dread.

9896. Can you give us any instances to show that?—When first I went there I found a woman in a field, a childless widow, and none of her relatives would go near her. They were standing about a dozen yards off looking at her, but none of them would go near or give her a drink of water.

9897. Did you find any difficulty in disposing of the dead bodies?—At first I did.

9898. Why?—They were afraid of catching the infection. A Hospital Assistant and myself had to carry some to the burning ground, but later on the Bhils volunteered and were paid for it, and sometimes the relatives.

9899. I understand that you did not resort to corpse inspection in the neighbouring villages?—No, every case of sickness was reported to me, and I went to see it, in the neighbouring villages—about 5 to 10 miles around.

9900. Did they always report sickness before death?—There were no deaths reported to me.

9901. Did deaths occur?—I do not know; possibly. There was no plague in the neighbouring villages. It did not spread.

9902. Have you anything to say with regard to the relation of temperature to the epidemic?—Yes; we found that when the temperature went down the number of attacks increased. I drew a chart* of that. I had not any instruments with me, but a record was kept in the town of Sirohi, about 12 miles away, where I think the temperature was much the same.

* *See* Appendix XXXII. in this Volume.

9903. Was there any mortality among the rats?—I did not see any dead rats, but plague was spoken of among the people in Rajputana as the rats' disease. *Capt. J. W. Grant, I.M.S.* 14 Jan. 1899.

9904. Did they refer to the Pali plague in the same way as the rats' disease?—I do not think they remember the Pali plague, but the records of it refer to rats having been infected. After the epidemic was at its height there was not a rat to be seen in any of the villages. I think, judging from what happened elsewhere, in Bombay especially, that the rats migrated from the villages to the wells, and infected the huts there.

9905. As a rule you would expect to find rats in the villages?—Yes, there were rats in the other villages.

9906. (*Dr. Ruffer.*) You say you had eight attacks among the attendants?—Yes.

9907. Can you tell me the number of attendants?—Each patient had a member of his family with him, and there were 140 cases of plague.

9908. That would make about 140 attendants?—Yes.

9909. The mortality among the attendants would be higher than among the rest of the villagers? I think you take the mortality to be about 1·72, 1·58, 1·22, and 1·75, which would give an average of about 1·50. Eight cases among 140 represents a mortality of about 5 per cent., which is considerably higher. I ask the question because we have been told that attendants do not take plague.—In this case I had reason to believe the attendants were incubating for plague before they went out to look after the sick. It was always one of the patient's family who went with him to attend on him, and he had been equally exposed to the original infection.

9910. How much of the roof did you take off?—They were tile roofs; we removed the tiles.

9911. The whole roof?—Pretty nearly. We stacked a certain number against the gables, the rest were taken down. The bamboos, when very close together, were taken off.

9912. Do you think the people objected to going into camp, and concealed cases on that account?—They did object to going into camp; it was cold at the time. When first they were told to go, they put it off, and said they would go afterwards, as they had many things to do.

9913. Do you think they concealed cases in order not to go into camp?—I do not know of any. They were very much frightened at first, and some abandoned their friends, leaving them alone in the infected house.

(Witness withdrew.)

(Adjourned till Thursday, January 19th, at Lahore.)

At Government House, Lahore.

TWENTY-NINTH DAY.

Thursday, 19th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Prof. A. E. WRIGHT, M.D.
Mr. A. CUMINE.
Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX, (*Secretary*).

Captain C. H. JAMES, I.M.S., called and examined. *Capt. C. H. James, I.M.S.* 19 Jan. 1899.

9914. (*The President.*) I understand that you were Deputy Sanitary Commissioner of the Punjab when the epidemic broke out?—Yes.

9915. What is your present office?—I am Civil Surgeon of Dharamsala.

9916. (*Dr. Ruffer.*) I think you were in charge of the epidemic in the Punjab, and, before that, had seen plague in Bombay?—Yes. I was in medical charge in the Jullundur District.

9917. We may go afterwards into your experience in Bombay, and will begin now with the history of the

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epidemic in the Punjab. What was the first village attacked in the Punjab?—Khatkar Kalan.

9918. Could you tell us the history of the epidemic in Khatkar Kalan?—I was sent for by telegram, and I arrived there on the 21st of October 1897. We had heard that there was a suspicious disease there which was supposed to be plague. The Sanitary Commissioner, the Deputy Commissioner of the district—Colonel Rennick—Mr. Jones, Assistant Commissioner, and myself, went there. We asked the villagers, first of all, to show us the house in which the first person was attacked with this disease, which they recognised to be quite new to the Province. They showed us the house of the man, Ram Saran. We did not take that statement at once as being correct; we went from that house and followed up other cases.

9919. Can you tell us the history of Ram Saran?—Ram Saran was a Brahman, who had gone in the spring of 1897 to Hardwar, on pilgrimage. He returned on the 28th of April, and was very ill indeed. He was in a state of high fever and delirium. He was not actually brought to the village, but was left on the high road, between Banga and Nawashahr, which is nearly a mile from the village. His friends from the village came and took him in. They got out of him the history that he had been ill for a few days at Rahon. If you look at the map* you will see how the place lies, *here* is Khatkar Kalan, and Rahon is down *there*. He died the following day at Khatkar Kalan, that is to say, on April the 29th. Nothing else happened after that to arouse any suspicions until a distant relative of Ram Saran's, a woman named Malan, was attacked with same sort of illness, the nature of which they did not know.

9920. That was about two months afterwards?—Yes, that was about two months afterwards—in July.

9921. What evidence have you got to show that Ram Saran had plague?—Of course it is very difficult to state definitely. The first thing is that the people themselves say that that was the first person who was attacked in this particular way with very high fever and delirium; in the second place during his delirium they seemed to have got information out of him; and there is also the fact that he died very rapidly from fever. That is the only evidence we have: we have no evidence that he suffered from buboes.

9922. The next case was that of a woman?—Yes, the case of Malan. She lived in a street quite close to Ram Saran's house, and running at right angles to it. She was ill for a few days and then died. Her son Ralli, aged 30 years, became ill about the same time. He was ill for a month, after which he died, on September 13th. We have got that date from the Thana Register at Banga.

9923. Is there any evidence to show that the son had plague?—He had a bubo and fever at the time, and it was thought that he might be suffering from syphilis, but the fact that he died very quickly from this fever I think makes it very probable that it may have been plague.

9924. He was ill for a month before he died, was not he?—Yes, he was ill about a month altogether.

9925. What was the first undoubted case of plague? These were simply suspicious cases, were they not?—These are, of course, only leading up. The first cases we saw were cases among the Chamars, on the 20th of October.

9926. What are Chamars?—A low caste people who work in leather.

9927. Could you trace the disease from this last man to the Chamars?—Yes. In the house exactly behind there were some Jats who were suffering from plague at the time of our visit in October, and behind those came the Chamars. All those were adjoining houses.

9928. Were the Jats related to these three first people? How did you trace the disease from that third man to the Jats?—They were not related to the third man; they are of different caste, but the houses were adjoining.

9929. So that, practically, you have only a suspicion of how it came in. You have no proof that either the Brahman or the woman or the man actually had plague?—We have no direct proof, but there are some other circumstances which make it probable, besides those I have already mentioned.

9930. On what date did you actually ascertain the first case of plague?—On the 21st of October.

9931. Then you took measures to disinfect the village?—Yes.

9932. At the same time that you did that, you examined other villages in order to ascertain whether plague existed in these villages, did you not?—Yes.

9933. Can you tell us what these measures were?—The measures were not taken by me. They were undertaken under the direction of the Commissioner. At first there were two medical officers told off to constantly inspect the villages round about in order to find cases of plague—Dr. Datta and Dr. Nicholson. They made frequent visits, and especially near Khatkar Kalan. Later on a more extended system carried was on.

9934. Did they turn the people out of their villages?—No, that was done afterwards, but not at first. They reported to me any cases of plague they found. In this way Jhandher Khurd, our second village, was discovered. Afterwards both the Jullundur and the infected part of the Hoshiarpur districts were divided into circles in which there were inspecting medical officers. The inspecting officers had Naib-Tahsildars, Hospital Assistants, and men called Kanungos, who had villages apportioned to them. They had to go round and inspect these villages very frequently. They had nominal rolls prepared of all the villages under them, and they turned out the people, and examined everybody, and anybody who was ill was at once reported to the officer, and if it was a suspicious case a medical officer was sent for and he examined the the case. In this way, of course, we began finding large numbers of villages. There was also another system, however, which we found worked better than this—a system of rewards. A reward of Rs. 50 was given to the person who first gave notice of a new infected village. That worked very well in our districts.

9935. Was not one of the chief men of the villages punished for not reporting?—In one village several Lambardars of Mallupota were punished for hiding the existence of plague. There were other villages where they tried to hide plague, but we could not get evidence strong enough to bring it before the Magistrate for conviction.

9936. Were there any drawbacks to the system of giving rewards?—We found none: it worked very well indeed. There was a suspicion that they might introduce other cases into their own villages in order to get the reward. I think that was only a hypothesis; I do not think it was ever done, because the people themselves are too much afraid of plague to allow it to be introduced from another village into their villages.

9937. Did you find that the poor classes only, and not the better classes, tried to claim the reward?—Generally the Head man of the village tried to claim the reward as well. Still, he was able to get information that we could not get, and could also give information about his own village.

9938. You give, in your official report,* a table of each village containing the census of the population, and the number actually found by roll-call. Does the roll-call give the numbers found by you?—Yes; actually the people that we put out into camp.

9939. Have you found a striking difference between the numbers given in the census of the population and and those ascertained by you in the roll-call?—Yes.

9940. What is that difference?—The number recorded on the roll-call is nearly always very much less.

9941. How do you account for that? I have looked through it and I find with one or two exceptions it is so; in one case it is nearly half?—Yes; it is in most cases much less. I have no proof to give you, but the suspicion is that people run away before we get to the village cordoned.

9942. You have given an example, for instance, of Balon on page 25 of your report*?—The census population there is 282, and the roll-call gives the number as 189.

* *See* Appendices, No. XXXIII., (1) to (6) in this volume.

* Report on the outbreak of Plague in the Jullundur and Hoshiarpur Districts of the Punjab, 1897-8, by Capt. James, I M S, not published with the Commission's Proceedings. A table giving a summary of information concerning the plague-infected villages of the Punjab in 1897-8, put in by witness, is printed as Appendix No. XXXIV. in this Volume.

9943. Then, I think, in Sahlkalan, on page 27, there was a similar striking difference?—There may be a reason for Sahlkalan. It is in a very bare district and the people are only Gujars who attend cattle and they migrate a good deal.

9944. Then Jhandher Khurd?—The census population is 800 and the roll-call 493.

9945. When people first reported cases, or when you and your assistants first discovered cases, were you satisfied that these were really the first cases of plague in that village?—In some cases we were not satisfied; often, at a later date, we got information of earlier cases which had occurred before our arrival. We found we got the best information from people when we allowed them to go back to their villages after operations were over.

9946. That was rather too late, was it not?—No, they then found out that there was nothing more to fear and that we did not want to get at them in any way and they were then much more communicative.

9947. In the first village was there not an interval of something like six months between the introduction of plague and the first case which was discovered officially?—Yes; but the disease was new to the province, and the people themselves, I am firmly convinced, did not know what it was.

9948. In Sahlon did not a month elapse between the introduction of the disease and the discovery of plague in that village?—Yes. Shikohpur, just before Sahlon, was another place where they hid it for a very long time.

9949. When the first case was found in a village, did you frequently discover several more cases on the same day?—Yes.

9950. Could you give some instances of that?—Mallupota is a very good instance.

9951. Will you give us the facts?—The disease was discovered there by Dr. Davidson on the 12th of February, when no less than nine cases were found by the medical officer on the same day.

9952. Was this not the case in several other villages?—Yes it was.

9953. Can you mention similar instances in other villages?—Lalpur was a case in point. Plague was discovered on the 5th of April and the village was immediately evacuated into two camps, the same day that the disease was found. We discovered no less than nine cases, and they all seemed to have broken out between the 2nd and the 5th.

9954. Did not a similar case occur at Mallah?—Yes. That was a small village of 443 inhabitants and we found four cases on the first day that we examined the people.

9955. Did you find that in spite of roll-calls a certain number of people actually present in the village at the time were not discovered?—Yes.

9956. Will you give us an example of that?—Sotran is one example and Haphowal is another. In the latter case the inspecting officers turned out the village in the morning and thought they had inspected everybody. On March the 28th (the same day) the Lambardars of the village reported that a Tarkhan family at the opposite side of the village had been attacked. No less than three Tarkhans and a Jattiwee were then found to be attacked. It is interesting to note that the whole village had been turned out and a roll-call held by the inspecting officers on the same morning and no unusual illness found.

9957. Was not that the case at Shikohpur also?—At Shikohpur there was an organised arrangement made to hide the cases; they went so far as to bury their dead within the walls of the village, which, of course, is never done ordinarily.

9958. You had a roll-call for three days, and then you suddenly discovered 13 cases?—We were pretty certain that plague was there. Our suspicions had previously been aroused.

9959. These were cases hidden in the village and discovered afterwards?—Yes. In that case they brought people out of cattle sheds where they had been hidden for several days.

9960. Does your inspecting staff consist of medical men?—Not entirely; there are a few medical men.

9961. Did you find drawbacks in having non-medical men as inspectors?—Certainly.

9962. What were these drawbacks?—Very often cases were reported to us as cases of plague which were not plague cases. We were on the executive staff and were very hard worked, and it was very trying sometimes to have to go out and see cases which any medical man would at once have diagnosed as not being plague. You must remember, of course, we were very short of medical men at the time, and it was absolutely a case of necessity.

9963. You would advise that, as much as possible, the inspecting staff should be medical men?—Yes, as much as possible. We had Hospital Assistants, but all our Hospital Assistants were new to plague work and they had not yet grasped the essential features in diagnosing plague

9964. Had your Hospital Assistants ever seen a case of plague before?—No, I fancy none of them had.

9965. When you evacuated a village and took the people into camp, did you find that the villagers actually hid cases in the camp?—Very rarely; it was very difficult for them to do so.

9966. Was this not done in one case?—Yes, in the case of Sirhal Qazian. That I think is the only case we had where people actually hid the cases, but they were discovered almost immediately.

9967. Did you find that the watchers—the policemen, for instance—got into communication with the villagers and contracted plague?—Yes, more policemen got plague than Hospital Assistants.

9968. Was there actual communication between the policemen and village people?—In most cases we could not find out how they got plague. I would not like to say how they got it. In one, or two cases we knew they went into the village and got plague.

9969. Did you ever discover cases by the report forwarded every week to the police station?—No, we were much quicker than that.

9970. Did you not discover one case in that way?—A village in the Hoshiarpur district was discovered in this way.

9971. When several cases are suddenly discovered in a village, does it not rather point to several foci of disease having been present in the village?—In some cases it does, certainly.

9972. Did you find one person was substituted for another in roll-calls?—Yes, that was so.

9973. Could you give us a specific instance of this?—Yes, in the case of Punian. In that case a woman who was attending on a plague case personated the woman whom she was attending. She had come from another village.

9974. Was not that the case at Bhaura too?—Yes, it was; there they did exactly the same thing.

9975. They substituted a living man for a dead one, did they not?—No; a man that was well for a man that was ill.

9976. I suppose the villagers hid cases in all sorts of places. Did they not actually hide them in the crops occasionally?—Shikohpur was the place where they did most of that sort of thing. One body was hidden in a dust heap, just in front of the man's quarters.

9977. How did you evacuate a village? Did you not in some villages evacuate only part of the village?—We tried that in some cases, mostly large villages, and especially in the case of Banga town, where we tried it on a large scale.

9978. You found that did not answer?—No. It usually failed.

9979. In most cases you evacuated the whole of the village?—We had to, eventually.

9980. What is the largest town that you evacuated during your time?—I think Banga, where the census was 4,727; but Dr. Clark evacuated Garhshankar, which was a larger town. That was 5,354 people.

9981. Could you put in a table showing the name of the village, the probable date of outbreak, the date of evacuation of the village, the total number of cases in the first 20 days after evacuation, and so on?—Yes the tables are as follows:—

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SHOWING the EFFECT of EVACUATION on the EPIDEMIC in the JULLUNDUR DISTRICT.

A. Serial No.	B. Name of Village.	C. Probable Date of Outbreak (*i.e.*, first Case).	D. Date of Evacuation of Village.	E. Total Number of Cases before Evacuation.	F. Columns showing the Number of Attacks, Day by Day, for the first Twenty Days after Evacuation.																				G. Total of last 20 Columns.	H. Total Number of Cases which occurred after the Twentieth Day of Evacuation.	J. Total Number of Cases up to Date.	K. Remarks.
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
1	Khatkar Kalan	28 Apr. 1897	28 Oct. 1897	68	2	2	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	8	3	79	
2	Jhandher Khurd	Unknown	11 Nov. „	9	1	–	4	2	3	–	–	–	2	–	–	3	–	1	1	–	1	–	–	–	18	2	29	
3	Khankhanan	„	6 Dec. „	115	5	8	8	6	1	6	1	–	–	2	1	–	1	3	–	1	–	–	1	1	45	*15	175	*Due to re-infection from the village.
4	Khatkar Khurd	23 Dec. 1897	29 „ „	4	–	1	1	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	6	—	10	
5	Shikohpur	Early in Dec. 1897.	2 Feb. 1898	23	6	6	5	6	6	5	3	1	5	1	4	–	–	–	1	–	–	1	–	–	50	2	75	
6	Sirhal Qazian	25 Jan. 1898	13 „ „	25	1	4	1	3	2	1	2	–	–	2	1	3	2	1	2	–	3	2	1	–	31	26	82	Very inclement weather when these people were turned out.
7	Mallupota	28 „ „	21 „ „	43	1	5	4	8	4	3	2	2	2	–	–	–	–	–	1	–	3	2	1	3	41	7	91	
8	Gunachaur	2 Feb. „	1 Mar. „	92	9	6	11	1	4	2	3	2	2	3	2	1	1	–	1	–	2	–	1	–	51	4	147	
9	Jhandher Khurd	12 „ „	Not evacuated	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	1	
10	Sahlon	During Jan. 1898.	4 Mar. 1898	46	2	–	7	8	4	8	6	6	1	2	2	3	1	2	2	1	2	–	1	–	58	3	107	Only one family evacuated.
11	Mehlgahla	22 Feb. 1898	17 „ „	16	1	2	1	1	2	1	2	–	–	–	–	–	–	–	–	2	2	4	8	–	26	59	101	Due to infection from village.
12	Kumam	20 „ „	6 „ „	†1	3	7	4	3	–	6	2	4	3	–	1	–	1	1	–	1	–	1	–	1	38	22	61	†There were four cases before evacuation which were not previously recorded.
13	Jagatpur	21 „ „	10 „ „	32	4	2	3	4	3	1	–	–	–	–	–	3	–	1	2	3	–	–	–	–	26	5	63	
14	Khatkar Khurd	27 „ „	28 Feb. „	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	2	—	3	Only two families evacuated.
15	Katharon	During Jan. 1898.	10 Mar. „	10	1	–	–	1	–	–	–	4	–	–	–	1	–	–	4	–	2	1	–	–	14	14	38	
16	Karnana	28 Feb. 1898	Not evacuated 1898.	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	1	*See also* No. 45. Not at first evacuated.
17	Balon	16 „ „	4 Mar. 1898	2	1	1	2	2	4	1	–	1	–	2	–	–	–	1	–	1	3	1	2	–	22	4	28	
18	Lakhpur	1 Mar. „	14 „ „	6	1	7	2	5	1	1	–	3	1	1	1	2	–	–	–	–	–	–	–	–	25	—	31	
19	Nurpur	28 Feb. „	9 „ „	12	2	1	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	4	3	19	
20	Lodhipur	14 „ „	10 „ „	11	2	4	8	2	3	2	5	2	2	1	1	–	1	2	–	–	–	–	–	–	35	3	49	
21	Salh Kalan	26 „ „	15 „ „	6	–	–	1	1	2	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	6	—	12	
22	Mahrampur	7 Mar. „	14 „ „	15	3	4	3	4	3	2	3	2	1	1	1	1	–	2	1	–	–	1	–	–	32	9	56	
23	Naura	5 „ „	10 „ „	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	1	Only one *mohalla* evacuated.
24	Masani	24 Feb. „	29 „ „	4	–	–	5	2	–	1	3	1	2	4	2	–	1	–	1	1	–	–	–	–	23	6	33	Evacuation was commenced on March 10, but the whole village was not evacuated till March 29.
25	Banga	7 Mar. „	30 April „	81	6	–	2	8	–	2	–	–	–	–	–	–	1	–	–	1	1	–	–	–	21	1	103	
26	Katt	24 Feb. „	16 Mar. „	9	4	2	6	2	–	–	–	–	–	1	–	1	–	–	–	–	1	–	–	–	17	3	29	
27	Haphowal	12 Mar. „	12 „ „	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	1	–	–	–	4	‡8	13	‡Due to people going into village.
28	Chakbilga	10 „ „	15 „ „	1	4	1	2	3	3	6	2	1	–	1	–	1	–	2	–	1	–	1	1	–	29	3	33	
29	Dhahan	7 „ „	15 „ „	12	3	4	5	9	2	–	2	3	–	–	1	–	–	–	1	2	1	1	–	–	34	1	47	

30	Tahirpur	8 Mar. 1898	24 Mar. 1898	7	11	–	–	2	1	5	2	1	–	–	–	–	–	–	–	2	–	–	–	24	—	31	
31	Mazara Nauabad	20 „ „	21 „ „	1	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	2	—	3	
32	Mahmudpur	4 „ „	24 „ „	9	1	4	2	1	1	–	1	–	–	–	–	–	–	2	–	1	1	–	–	15	—	24	
33	Sotran	18 „ „	24 „ „	3	2	2	3	1	–	–	2	–	–	–	–	–	–	1	–	–	–	–	–	11	3	17	
34	Musapur	18 „ „	25 „ „	4	–	4	8	4	5	2	–	–	1	–	1	1	–	–	–	–	–	–	–	26	2	32	
35	Sodhian	26 „ „	29 „ „	1	1	2	4	2	1	1	2	–	3	–	3	–	–	–	–	–	–	–	–	19	1	21	
36	Lidhar Kalan	25 „ „	30 „ „	6	6	2	–	1	1	1	2	–	1	1	–	1	–	–	–	2	–	–	–	18	2	26	
37	Khanpur	27 „ „	1 April „	9	1	1	2	3	2	–	–	1	1	–	–	–	–	–	–	–	–	–	–	11	2	22	
38	Bahrwal	23 „ „	2 „ „	8	2	3	1	–	1	–	–	–	4	–	–	–	–	–	–	–	–	–	–	11	3	22	
39	Mazari	1 April „	3 „ „	2	–	–	1	4	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	6	—	8	
40	Salh Khurd	29 Mar. „	6 „ „	11	–	3	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	—	16	
41	Heon	30 „ „	4 „ „	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	2	
42	Langeri	1 April „	5 „ „	4	1	3	3	1	4	–	–	2	–	1	3	–	–	–	–	–	–	–	–	18	2	24	
43	Lalpur	2 „ „	5 „ „	8	1	2	9	1	3	–	2	–	–	1	–	–	1	–	–	–	–	1	–	21	—	29	
44	Chahlon	31 Mar. „	6 „ „	6	–	3	1	3	2	5	3	1	3	–	–	–	–	1	–	–	–	–	–	22	1	29	
45	Karnana	28 Feb. „	7 „ „	6	10	2	3	4	–	5	1	–	3	–	1	1	–	3	1	–	–	–	1	35	1	42	
46	Bisla	1 April „	6 „ „	3	1	–	1	–	7	3	2	–	1	1	1	1	–	1	1	1	–	–	–	21	4	28	
47	Aur	5 „ „	Not evacuated	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	1	Not evacuated. *See* No. 75.
48	Malpur	Unknown	9 April 1898	4	–	2	–	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	5	—	9	
49	Bika	9 April 1898	10 „ „	1	–	–	–	–	8	–	–	–	1	–	–	–	–	–	–	1	–	–	–	10	5	16	
50	Hansaroa	14 „ „	13 „ „	9	1	3	11	3	6	1	5	1	–	–	–	–	–	–	–	–	–	–	–	31	—	40	
51	Sirhal Mandi	13 „ „	7 May „	55	1	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	2	—	57	
52	Dhandhua	10 „ „	15 April „	1	–	3	3	–	–	2	1	2	2	1	–	–	–	1	4	–	–	–	1	20	2	23	
53	Mokandpur	9 „ „	11 May „	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	15	
54	Gobindpur	8 Mar. „	25 April „	16	1	–	–	–	–	1	1	–	–	2	1	1	–	–	–	–	–	1	–	8	—	24	
55	Lehl	12 April „	18 „ „	11	4	2	–	4	2	–	1	1	2	1	–	–	–	–	1	1	2	–	–	22	1	34	
56	Chak Kalal	17 „ „	5 „ „	0	–	3	3	7	7	1	2	2	–	3	2	2	–	–	–	–	–	–	1	32	—	32	Evacuated previous to being attacked. They were infected by rats on return to village on 15 April.
57	Punian	14 „ „	25 „ „	38	4	3	5	4	1	–	–	2	–	–	1	–	–	–	–	–	–	–	–	20	—	58	
58	Kariha	5 „ „	4 May „	126	–	10	9	35	3	5	2	–	2	–	–	–	–	–	–	–	–	1	–	67	2	195	At first refused to come out. Suffered severely in the village.
59	Piragpur	Unknown	1 „ „	47	11	9	2	5	4	2	1	1	–	1	–	–	–	–	–	–	–	–	–	36	—	83	
60	Rasulpur	10 April 1898	29 April „	12	3	4	8	5	2	3	3	2	–	–	–	–	–	–	–	–	–	–	–	30	—	42	
61	Rehpa	16 „ „	22 „ „	3	1	5	–	3	2	–	2	2	2	–	–	–	–	–	–	1	–	–	–	18	—	21	
62	Gosal	21 „ „	25 „ „	3	–	4	1	–	–	–	–	1	1	1	–	–	–	–	–	–	–	–	–	8	—	11	
63	Bhangal	10 „ „	27 „ „	8	9	3	9	3	4	1	2	2	1	–	3	–	–	–	–	–	–	–	–	37	—	45	
64	Bajon	20 „ „	29 „ „	10	2	2	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	6	—	16	
65	Mallah	21 „ „	26 „ „	4	–	3	1	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	—	11	
66	Aujla	21 „ „	13 May „	4	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	—	5	
67	Chhokran	16 „ „	13 „ „	4	1	1	1	–	1	1	–	–	–	–	1	–	–	–	–	–	–	–	–	6	—	10	
68	Laroya	21 „ „	18 „ „	4	3	–	1	–	1	–	–	3	–	–	–	–	–	–	1	–	–	–	–	9	—	13	
69	Pharala	12 June „	20 „ „	4	–	–	–	1	–	2	4	1	–	–	–	–	–	–	–	–	–	–	1	9	5	18	
70	Ladhana Jhika	11 May „	22 „ „	5	–	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	—	9	
71	Bhaura	1 June „	26 „ „	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	—	4	
72	Turan	5 May „	25 „ „	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	—	4	
73	Jhingar	28 April „	26 „ „	2	3	–	1	2	–	1	3	1	–	–	–	–	–	–	–	–	–	–	–	11	—	13	
74	Bahrwal	22 July „	Not evacuated	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	1	
75	Aur	5 April „	23 July 1898	3	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	—	4	The whole village was not evacuated till August 11. But there were no more cases. *See* No. 47.
			Total	1,135	146	159	181	190	117	92	82	61	49	34	35	28	11	25	25	26	26	17	20	9	1,333	139	2,707	

NOTE.—Since submitting my official report, I have again compared the figures with the original registers in order to get this table as accurate as possible.

MINUTES OF EVIDENCE.

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SHOWING the EFFECT of EVACUATION on the EPIDEMIC in the HOSHIARPUR DISTRICT.

A. Serial No.	B. Name of Villege.	C. Probable Date of Outbreak (*i.e.*, 1st Case).	D. Date of Evacuation of Village.	E. Toral Number of Cases before Evacuation.	F. Columns showing the Number of Attacks Day by Day for the first Twenty Days after Evacuation.																				G. Total of last 20 Columns.	H. Total Number of Cases which occurred after the Twentieth Day of Evacuation.	I. Total Number of Cases up to Date.	J. Remarks.
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20				
1	Birampur	5 Nov. 1897	26 Dec. 1897	24	1	2	1	–	2	–	–	–	1	1	2	–	–	1	–	–	–	–	–	2	13	12	49	
2	Purkhowal	27 Jan. 1898	3 Feb. 1898	8	Thirteen cases.																				13	2	23	Thirteen cases occurred during the first 20 days, but it cannot be ascertained on which days they occurred.
3	Rampur-Bilron	31 „ „	6 May „	23	6	3	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	10	*10	43	*Seven of these cases occurred really before the evacuation of the village during the month of April, but they were not shown in the report till the 7th June 1898.
4	Simul Mazara	28 „ „	5 Mar. „	8	–	4	2	3	2	1	3	1	1	1	2	–	2	1	4	2	1	1	3	–	34	9	51	
5	Dheron	27 „ „	20 Feb. „	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	4	
6	Bhajjal	6 Feb. „	24 „ „	10	4	3	4	4	7	5	3	3	–	4	–	1	–	–	–	–	–	1	–	–	39	3	52	
7	Sadhowal	Unknown	6 Mar. „	—	3	–	2	–	2	2	6	1	–	–	1	1	–	–	–	–	–	–	–	–	18	4	22	
8	Hajipur	6 Mar. 1898	2 April „	45	8	12	2	6	4	7	–	–	–	1	3	–	–	–	–	–	–	–	–	–	43	2	90	
9	Parowal	18 „ „	24 Mar. „	10	–	4	2	3	–	4	1	2	–	–	1	1	–	–	–	–	–	–	–	–	18	2	30	
10	Garhshankar	23 „ „	2 May „	94	13	13	10	8	8	4	1	1	1	3	–	–	–	–	–	–	–	–	–	–	62	1	157	
11	Sanwali	Unknown	5 April „	16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	—	—	16	
12	Kullewal	„	30 „ „	17	2 On 1st and 2nd days.	–	–	–	1	–	1	–	–	–	–	–	–	–	–	–	†5	–	–	–	9	1	27	†These five cases which should have been previously entered were omitted by mistake.
13	Garhi	„	30 „ „	19	56		13	5	8	1	2	–	–	1	–	1	1	–	–	–	1	1	–	–	90	1	110	
14	Chinkoá	21 April 1898	1 May „	4	1	–	1	–	–	–	1	–	–	1	1	1	–	–	–	–	–	1	–	–	7	3	14	
15	Bhugwain	12 May „	20 „ „	5	–	2	1	2	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	6	—	11	
16	Palewal	Not stated	13 June „	1	1	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	—	4	
			Total	288	95	45	38	31	34	24	18	8	4	12	10	5	3	2	5	2	7	4	3	2	365	50	703	

TABLE showing the PERIOD which ELAPSED between the DATE of the TOTAL EVACUATION of the VILLAGE and the DATE of the last CASE OF PLAGUE.

JULLUNDUR DISTRICT.						HOSHIARPUR DISTRICT.		
Serial No.	Name of Village.	Last Case. Number of Days after Evacuation.	Serial No.	Name of Village.	Last Case. Number of Days after Evacuation.	Serial No.	Name of Village.	Last Case. Number of Days after Evacuation.
1	Khatkar Kalan	36	38	Bahrwal	24	H 1	Birampur	42
2	Jhandher Khurd	37	39	Mazari	7	2	Purkhowal	35
3	Khankhanan	53	40	Salh Khurd	4	3	Rampur Bilron	42
4	Khatkar Khurd	12	41	Heon	None.	4	Simul Mazara	27
5	Shikohpur	31	42	Langeri	29	5	Dheron	None.
6	Sirhal Qazian	54	43	Lalpur	18	6	Bhajjal	33
7	Mallupota	31	44	Chahlon	24	7	Sadhowal	21
8	Gunachaur	27	45	Karnana	26	8	Hajipur	25
9	Jhandher Khurd	None.	46	Bisla	33	9	Parowal	36
10	Sahlon	27	47	Aur	None.	10	Garhshankar	52
11	Mehlgahla	47	48	Malpur	8	11	Sanwali	5
12	Kumam	25	49	Bika	37	12	Kulewal	33
13	Jagatpur	34	50	Hansaron	8	13	Garhi	22
14	Khatkar Khurd	19	51	Sirhal Mandi	10	14	Chinkoa	36
15	Katharon	37	52	Dhandhua	22	15	Bhagwain	8
16	Karnana	Not evacuated.	53	Mokandpur	None.	16	Palewal	None.
17	Balon	29	54	Gobindpur	18			
18	Lakhpur	12	55	Lehl	25			
19	Nurpur	37	56	Chak Kalal	12			
20	Lodhipur	34	57	Punian	11			
21	Salh Kalan	11	58	Kariha	31			
22	Mahrampur	46	59	Piragpur	10			
23	Naura	None.	60	Rasulpur	8			
24	Masani	38	61	Rehpa	17			
25	Banga	51	62	Gosal	10			
26	Katt	40	63	Bhangal	11			
27	Haphowal	52	64	Bajon	8			
28	Chak Bilga	30	65	Mallah	4			
29	Dhahan	18	66	Aujla	5			
30	Tahirpur	16	67	Chhokran	12			
31	Mazara Nauabad	6	68	Laroya	16			
32	Mahmudpur	20	69	Pharala	31			
33	Sotran	37	70	Ladhana Jhika	2			
34	Musapur	45	71	Bhaura	2			
35	Sodhian	26	72	Turan	2			
36	Lidhar Kalan	29	73	Jhingar	8			
37	Khanpur	25	74	Bahrwal	None.			
			75	Aur	1			

NOTE.—Average in the Jullundur District - - 21 days.
" Hoshiarpur " - - 26 "

9982. What do you think is the normal length of an epidemic in a given locality in which no, or only inefficient, measures are taken? I think in one part of your Report* you state it to be about five months?—That I took from some reports that came out either in the "Lancet" or "The British Medical Journal," regarding the Cutch district, where they had some villages infected and left untreated.

9983. You have had no personal experience?—Except of the one village we had going for six months, Khatkar Kalan, and in some other villages. In some of these villages, you will see in a table* given at the end of his review of my Report, the Lieutenant-Governor gives the time the disease had existed in a village in days before it was discovered by us. You see there in Khatkar Kalan it was at least 180 days; in Shikohpur it was probably 60 days; in Sahlon it was probably a month; in Katharon (?) a month. In those cases it showed no signs of diminishing at all.

9984. When you evacuated the town, did you clear everything out of the houses—stripped the houses, practically?—No; we allowed the owners to take as much as they could take, we did not strip the houses. They left a certain amount of property behind locked up in their houses. We stripped the houses later, when we disinfected them.

9985. What was the first thing you noticed after the villagers were camped out? Did you find that there was an increase of cases reported in the first few days after evacuation?—Yes, on the whole that was so.

* Not printed with the Commission's Proceedings.

9986. For how long did that last?—The increase was generally for the first four or five days, and then we got a steady decrease; at the end of 20 days we used only to get dropping cases. There are some exceptions, but in most of those we were able to find very good reasons for it.

9987. Could you give us some instance of that increase?—Yes, Mehlgahla was a village in which we got, I believe, the very first case. It was a girl we had traced to that village by our roll-calls from Mallupota. Dr. Davidson, who was the inspecting officer, watched her for some days. She left about the 12th, I think it was, and nothing happened for 10 days. She was then discovered to have symptoms of plague, which was reported by her father-in-law immediately. Dr. Davidson saw her on the very day she was attacked. I got her out into camp the following morning. As this was an imported case, we tried there the system we had tried several times, of only turning out that one house. It was hoped that we had dealt with the infection in time to stop it. The first case was on the 23rd of February. About three weeks afterwards, the 15th of March, the Lambardars came up and said that the Chamars had got attacked, and we found no less than seven Chamars attacked. One of them, the first attacked as far as we could make out, was the Chamar who had worked in the house of the first case. On that we promptly turned out the whole village and got it out by the 18th—three days afterwards. We started the disinfection of the infected house, that is to say the Chamar's house (the first house had been disinfected a a long time ago). We started the disinfection of the infected houses on the 22nd, and we had finished all

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the non-infected houses by the 28th. The epidemic appeared to have stopped on the 25th of the month—that is to say, from the 15th to the 25th, in 10 days. The whole village was out in camp. We had no more cases until the 2nd of April. In the meantime we were going on with the disinfecting of the Chamars' houses, which were at the south-east corner of the village. As we began Uttam Singh's pattis, we began to get cases again among the workers in the village. When we evacuated, as far as we knew, the village was free from from plague, except at the Chamars' corner. When we began disinfecting the village we kept on getting people infected all over the village. Each new patti always gave us a new crop of cases. Large numbers of dead rats were found in the village, which were certainly not there when the people left the village. They knew nothing about the rats dying. We knew one or two people who went into the village to get things who were also attacked with plague, and this seems to have kept on the epidemic longer than our 20 days, but we have very clear evidence to show the sources.

9988. Did not the disease stop at once after evacuation in some cases?—Yes. That was mostly in the hot weather. It stopped quicker as the weather got hotter, when we got the people into camp. In the cold weather dropping cases kept on for some time in camp, but in the hot weather we hardly ever had that.

9989. Could you give us a case where plague stopped immediately after the evacuation?—There are the villages of Palewal, Heon, and Mokandpur.

9990. What was the longest time the disease lasted in villages after the village has been evacuated?—53 days in Khankhanan.

9991. Do you think it is a fair test to compare the number of cases before and after the evacuation of a village?—No.

9992. Why not?—There are several sources of fallacy. In the first place, of course, we cannot get hold of all the cases that occur in the villages previous to evacuation. The second reason is this that in some places the disease has been going on for a very long time, and figures are unreliable; and thirdly, in cases where we got the first case, practically the outbreak started as we got the people out into camp. If we got the first case on the day of evacuation, and it infected three or four other people who showed symptoms a few days later, it would look in the returns as if there was only one case case before we turned out the village, and four cases afterwards. That would tell unfavourably against evacuation, not only unfavourably but unjustly.

9993. Did you disinfect the people and their effects before moving them into camp?—We tried to do it in some cases, but usually it was found better to turn the people out first, and disinfect them when we got them into camp.

9994. Can you tell us an instance in which you stopped the plague in a camp by disinfecting the whole camp?—A very good case is Shikohpur. The people were all got out into camp by the evening of February 2nd, which was quick work, as the huts for them had to be brought from Banga, 10 miles away by road. They were placed in four camps, viz., segregation camp, hospital camp, healthy Jats' camp, and healthy Chamars' camp, on the south side of the village. The hospital was situated south-east of the village. Even after the people came out, dropping cases occurred among them; in consequence of which Dr. Walton had all the clothes and property in all the camps disinfected. The result was immediate. The disease stopped, and with the exception of one dropping case of a man on the disinfecting staff, who was attacked on March 3rd, no new cases occurred.

9995. You had several similar cases, had you not, showing the beneficial results of disinfection?—Yes.

9996. Could you tell us exactly the details of the disinfection you performed in villages? In the first place, what were the instructions which you gave to your disinfectors?—The method of disinfection as carried out in the Jullundur and Hoshiarpur Districts consisted of four stages or divisions, each having a special object. The stages were as follows:—(1) Disinfecting with antiseptic solutions; (2) Cleaning; (3) Ventilating; and (4) Whitewashing. Possibly one or other of these processes may have been sufficient, but on account of the difficulty of making sure, or indeed guessing the position of the infection, and also being sure that every part of the building and every article contained in it had been thoroughly disinfected, it was necessary to go through the whole of the processes wherever practicable. For instance, strong antiseptics might have been played on to every wall, floor, and ceiling in every room; but when the inspecting officer came round a few hours later, not a sign of the antiseptic would be seen, as the earthern walls take up the moisture and dry quickly.

9997. Do you think you could suggest a method by which you could see with certainty whether the place had been disinfected or not? Do you think the people would have any objection to you adding methylene blue to the perchloride?—No; we tried it, but the colour does not show on mud walls in the least, even in strong solutions. It was tried by Dr. Wilkinson as well; it was tried two or three times. In the processes carried out by us, there was no possibility of any room remaining unfinished as long as proper care was taking in the inspecting. Thus, even if a room remained untouched by the antiseptic, the subsequent opening up of the roofs, lime-washing of the walls, &c., which all could be seen by the inspecting officer, even days afterwards, left little chance for the plague germs to remain alive.

9998. Each disinfecting gang was in charge of a Hospital Assistant, a native, I suppose?—Yes.

9999. You had policemen, water-carriers, coolies, and sweepers for general cleaning up?—Yes.

10,000. Did you find there was a great danger to the disinfecting gang, and that a great many of them got plague?—Yes; I think it is the most dangerous work.

10,001. Could you tell us roughly how many of the disinfecting gang got plague?—I have no record, but I should think quite 50.

10,002. Fifty, out of how many?—I cannot tell you exactly, because there were varying numbers from day to day.

10,003. Could you tell us what were the precautionary measures you took to prevent the workers on the disinfecting gangs being attacked with plague?—These were the rules:—

"1. All persons working in the gang must wear shoes, and no person should be allowed to enter any house or building with bare feet.

"2. The gang should be inspected daily before beginning work, and all persons with cuts, scratches or sore places on their hands or legs should not be allowed to work till these abrasions have healed.

"3. The disinfecting gang should be particularly warned of the danger of raising the dust. When roofs are being opened, or floors dug up, coolies with pumps should always be at hand and spray water or phenyle solution over the dry earth as it is being removed. Men on this work should tie their pugris over their mouths.

"4. When the gang takes its midday meal, all should wash their hands outside the village, and the persons who bring the food should not be allowed to mix with the gang who should be kept separated in an open field while having their food."

That rule we found very useful.

"5. The gang should be given a phenyle bath, or at least have the phenyle spray from the hand-pump played on them, before leaving the village in the evening."

10,004. I do not quite see the object of this last rule?—Because they might carry infection in their clothes, it is very easily done.

10,005. What strength of phenyle did you use in your baths?—Roughly, about 1 in 200.

"6 No person whatever should be allowed to smoke a hookah or eat his food inside an infected village."

We had to punish a good many people for breaking that rule.

"7. No person should be allowed in the village, unless brought in by the Hospital Assistant to open his house or watch his property while it is being disinfected. He should always be placed in a position of safety."

That means out in the open as a rule.

"8. The disinfecting gang should all, if possible, be inoculated with Haffkine's prophylactic medium."

10,006. Did you, in one case, inoculate the disinfecting gang with Haffkine's prophylactic fluid?—In two or three cases we did it.

10,007. Did you get any cases of plague among the inoculated sweepers?—Yes, we did.

10,008. How many?—One case in Pharala. There was a doubtful second case, but I do not think it was plague. The man only had two or three days' fever.

10,009. One man?—Yes.

10,010. Do you think the percentage of uninoculated sweepers who got plague was greater than the percentage of plague among inoculated sweepers?—I could not tell that.

10,011. You said 50?—I do not know the number working.

10,012. Could you give us an approximate idea?—The figures did not come to me; they are not in the statistics I received.

10,013. (*Prof. Wright.*) Was it 5,000?—No, nothing like that number.

10,014. (*The President.*) Who can give that information?—I think that would be given from the Civil side, who had the paying of the coolies who did the work.

10,015. (*Dr. Ruffer.*) Will you give us the rules you applied when disinfecting a house?—They are as follows:—When houses had to be disinfected the following procedure, which applied to all the buildings in the village, whether actually known to be infected or not, was carried out. The disinfecting gang was collected in the street near the house, and all the materials required were placed in readiness in some some convenient open space, if possible, near the centre of the area to be dealt with. The owner of the house was brought in by the Hospital Assistant, or the constable, from the camp where he was living and allowed to open the lock of his door, and then made to sit down in the street, somewhere where he would not be in the way, and where he could watch all that was being done to his house and property. But he was not allowed to take any active part in the disinfecting or to enter any of the rooms till they had been disinfected. With pumps and syringes a stream of antiseptic solution was made to play on the closed doorway till the woodwork was thoroughly wet. It may seem unnecessary to begin using the antiseptic so soon, but the object was to impress the workers that they had to deal with infected places, and it was necessary to teach them thoroughness from the very commencement and to insure the good work, without which the object for which they strove would not be obtained. The door was then thrown wide open, and before anyone was allowed to enter a stream of antiseptic was made to play over as much of the interior of the room as was visible from outside. Thus, the dust inside was laid, and it was fairly safe for persons to enter. The pump-men then went inside, and from the centre of the room continued the pumping till every part of the ceiling, walls, and floor were wet and running with antiseptic solution. Other coolies now entered and carried out into the open every piece of furniture or movable property, while they were still wet with the lotion, and placed them either in the roof in one corner, or in some convenient place in the yard or even in the street where they could get the full benefit of the direct rays of the sun. All rubbish, rags, or articles of no value to the owner were taken out into the open and burned. Small articles were dipped bodily in vessels containing antiseptic fluids which were kept in readiness near the doorway. The owners were encouraged to take as much as possible of their property away into their camps after it had thus been thoroughly disinfected. We found this necessary because when people went out hurriedly into camp, afterwards they found they wanted things. The Hospital Assistant and the disinfecting gang and officers were all present, and we could disinfect their articles and let them take them out with them. Corn, seeds, flour, *haldi* and such articles which would be spoiled by placing in water were spread out in the sun for a day; the vessels which had contained them were disinfected *secundum artem* and, when dry, the various materials were returned. Books and manuscripts were also exposed to the sun's rays. I may mention that after the 15th of April, we found that the sun's rays equalled 160° Fahr. It was very hot after the 15th of April actually in the sun. The dry places, left by removing articles from the rooms, were at once tackled by the pump-men, who directed a jet of antiseptic towards every space thus left undone. In the same way, articles removed were subjected to a thorough drenching with antiseptic, when they got outside.

10,016. What antiseptics did you use?—When we began the plague operations in the Jullundur district we used perchloride of mercury, or sublimate solution as it is often called, 1 in 2,000. But we very soon found that there were disadvantages connected with this form of antiseptics. The water in the district contained a large quantity of lime salts which precipitated the mercury salt as a fine powder, and rendered the solution we were using inert.

10,017. Is not that the case in many places in India?—Yes it is.

10,018. Could you suggest any way of remedying this state of things?—Of course, we could put sulphuric acid with it, but we found in doing that we damaged our pumps. We were using metal pumps. Another great disadvantage about mercury is that it spoils so many things in the house; it has a corrosive action on metals.

10,019. Did you notice any cases of mercurial poisoning among your sweepers?—We had to drop the mercury very soon and we never had a case of mercurial poisoning.

10,020. Have you heard of any case of mercurial poisoning among disinfectors?—No, we have not had any instances ourselves.

10,021. You substituted phenyle?—Yes.

10,022. What strength of solution of phenyle did you use?—We made a solution by adding the strong phenyle from the tin, in vessels of water, till we got it the thickness of fresh milk, and a little taken up in the hand ought not to show the flesh through the solution.

10,023. What strength was that?—I tested it and it was, roughly, 1 in 200.

10,024. You made ventilation holes in the roofs?—Yes.

10,025. Did you find that answer?—Yes, I think it was very useful.

10,026. How much of your good results do you attribute to the opening of the roofs and how much to the antiseptics?—I cannot tell, of course, but I think the openings are beneficial because they allow the inside of the rooms to dry thoroughly; they let in light and air. Another use was that we could see better what to do inside the rooms—many of them had no windows at all, and their doorways led into other rooms—such rooms are little more than absolutely dark cupboards.

10,027. Did you do anything to the roof?—Yes. In the case of infection we removed the whole roof. When the Hospital Assistant or other inspecting officer was satisfied that the room had been thoroughly saturated with the antiseptic, he had the doors of the room shut, and coolies went on to the flat roof and made a hole in it, large enough to admit plenty of sunlight and air into the room below.

10,028. Did you find that it was impossible to do that in some cases—in double-storeyed houses, for instance?—Yes.

10,029. And I suppose in houses which contained store and perishable goods?—Yes; we took those out always. There were large stores in Banga; we took those out—it was a tremendous business always, but it had to be done. An opening of less than 6 feet by 4 was not allowed, and often much larger ones were made in every house of the village. In the case of infected houses the entire roof was removed. In making the openings, called moga by the people, it was always necessary to bear in mind the position of the larger beams (shahtir) below. For, it is awkward and spoils much of the benefit of the moga to have a large beam running through the middle of it. If the opening is not made in the middle of the roof, it should be made on the south side of the centre, as this position allows the direct rays to act on the largest portion of the room. The surface mud of the roof was dug up and placed neatly all round the opening to make a ledge which prevented rain-water from running off the rest of the roof into the room through the moga. The phoos or grass and matting which lay below the mud was next removed and always burned, as it has a tendency to make a litter and to blow about. The rafters (karian) were finally taken out and placed neatly on one side.

10,030. Then you limewashed the houses?—Yes; we were using unslaked lime—fresh lime.

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10,031. What strength did you use, 30 per cent.?—Yes.

10,032. Will you explain how you made it?—The method was putting the lime into the water until a thick mixture was obtained.

10,033. Is that about 30 per cent.?—I should think it would be quite that.

10,034. What is the germicidal power of this fresh lime?—It would be very strong. It was caustic; it was so strong that it often blistered the men's hands who were using it, and we had to allow them oil and other things in some cases to protect their hands.

10,035. Do you think you could make use of unslaked lime in the hot weather or the damp season?—No. Not in the rains. We were very fortunate in having lime places near us at Bharampur and Garhshankar. We had great facilities for procuring lime in large quantities.

10,036. You left the houses open after disinfection?—Yes.

10,037. Did you take up the floors in many cases?—Yes, in the infected houses we always did.

10,038. Do you think that is a good method?—No.

10,039. Why?—In some cases it causes a great deal of blowing about of dust. It is a dangerous process, and I fancy if we were to allow the lotion to lie on the floor it would be quite as effective. The people themselves under ordinary circumstances never dig up their floors. I suppose we dug up floors which had not been dug up for generations. It is rather an expensive method, and takes a lot of time.

10,040. Do you think the plague bacillus could have gone any distance into the floor?—No, I should not think so.

10,041. Why not?—It is an ærobic species, and requires air.

10,042. How did you deal with cattle sheds?—They were treated on the same lines, but in many cases we did not limewash them as they were not places in which people lived. In all other respects they were treated practically in the same way as the houses.

10,043. What length of time did you allow to elapse between the evacuation of the village and the beginning of the disinfection?—At one time a rule was made that we were to allow an interval of ten days.

10,044. What was the reason for that rule?—At that time we were finding many dead rats which had evidently died of plague, and it was suggested that possibly we were driving diseased rats from one village to the next, and the idea was to give them time to die in their own houses.

10,045. Did you give up that method after a time?—Practically.

10,046. You do not think it is necessary?—No, I do not think so; I think it is more theoretical than real.

10,047. Did you ever have a case of plague occur afterwards in a house which had been disinfected?—Yes, but I do not think we had a single case of a house that we knew to be infected that had been disinfected getting a case again afterwards; but we had some houses in the village which were not known to be infected houses. They were rare. Practically we had very few cases in houses previously disinfected.

10,048. How about the clothes of those people and their personal effects—how did you disinfect them?—They were dipped into phenyle solution and then spread out in the sun. Another thing we made all the people do when they first got out into camp was to put out all their property in the sun every day for 10 days. That was useful where we could not begin the disinfection of the camps at once.

10,049. Did you disinfect the people and their effects with phenyle before you allowed them to go back to their villages?—Yes. All their property was dipped in phenyle, and they themselves had to take a phenyle bath.

10,050. I think, in six villages, plague happened after disinfection of the village?—Yes.

10,051. How do you account for that?—In Jhandher Khurd we knew it was re-infection; we followed a man from another village, we knew where he had been. In Khatkar Khurd, where the Jats had only suffered before, we got a Chamar woman attacked at the other end of the village. The woman sold grass at Banga; she wandered about, and the probability is that she got it from elsewhere. In Karnana it was not really re-infection; we thought only one man was attacked, and did not evacuate the village, but later on we found more people in the same village attacked. That is not really re-infection, it is the same epidemic practically, and the village had not been disinfected. In Bahrwal the village was declared free on June 22nd. A barber's son was found infected on the 23rd of the same month. The father at the time was wandering about and known to be taking clothes and things from other villages. The source of the infection is not known, but the probability is that it was a case of fresh infection. In the case of Aur we do not know how the the disease spread. That was a village in which we only turned out a small number of people, and later on we found other parts of the village infected. As regards Rampur Bilron, Dr. Clark will be able to tell you about that. That was a case in which we only found a small part of the village infected, which we turned out, and probably the place was re-infected twice.

10,052. So that this case does not prove anything against disinfection?—No. I want to give you the case of the village of Pharala. That was the only case where the infection seems to have remained behind after disinfection. And in that case we know that the disinfecting was rather hurriedly done in order to get the people in before the rains came on. It was very important to get them back out of camp before they got swamped. A case was found, after their return, in a house previously believed to be free of plague.

10,053. On page 115 of your Report* you make a very definite statement which I should like to have down in the evidence?—Yes. "If plague is introduced into a "village recently disinfected, it shows little or no "tendency to spread, and the evacuation of one or "two houses is usually quite sufficient to check the "second outbreak." I gave that from the information I had received among our villages. We have had two or three villages in which there has been a re-infection, and we did not get the disease spreading. It is a limited experience, but as far as it goes it is consistent.

10,054. How long after the conclusion of disinfection did you keep the people out in camp?—In some cases they went in two or three days after the disinfection was finished. The point we went for was that they should always remain free from disease in their camps for three weeks. It was a fortnight at one time, but three weeks is the usual time.

10,055. Did you have systematic observation of these people after they had returned to their houses?—They were examined every day by the Hospital Assistant. The medical officer held a final roll-call, and inspected everybody in the village on the 10th day, when the village was declared free.

10,056. I believe you had a system of cordons around the camp, had you not?—Yes, we had a system of police cordons.

10,057. Could you give us an account of how these cordons were arranged?—There were two cordons. One was the cordon round the village area. Round every village there is a certain amount of land—a number of fields which belong to the village—this is known as the village area. Outside this area we had a cordon during the day-time of usually about eight sentries to the mile, and no one in the village was allowed, under any pretext whatever, to go outside that cordon. Practically we had not enough police to do the work at all times. There was another cordon put round the village site after the people had gone out into the camp; the villagers were free to go out to their fields during the day-time, but they could not leave the village area; and they could not get into the village site. At night these cordons were drawn round the camps themselves.

10,058. I take it from your Report* that these cordons were rather a failure, were they not?—We had a great many cases where infection was spread in spite of the cordons.

10,059. Could you give us any details of that?—On looking back on the history of the spread of the epidemic, we find that there is a record of human agency in the case of 67 villages, and on further analysing these cases we find that in 45 cases the

* Not published with the Commission's Proceedings.

people carrying the infection must have broken through the cordon.

10,060. In the majority of cases did you have only about eight policemen for one mile?—Yes. Eight sentries. Each sentry was relieved at stated periods, so that 24 men were required for eight sentries.

10,061. Do you think it is possible to establish a good cordon with that number of policemen?—That number cannot make a very strong cordon, but it has a very strong moral effect. It keeps large numbers of people from going out.

10,062. Theoretically, I suppose, it is a very good thing, but practically, under existing circumstances, do you think it is a good system?—I do not think it is a good system.

10,063. Do you think it does it a great deal of good?—It does a great deal of good, but I do not say the system is perfect.

10,064. In one case did not a sepoy of the cordon help people to evade the rules?—Yes, there was one case.

10,065. Will you give us the details?—It was in the case of Dhandhua. Dhandhua, a Muhammadan village, was situated between Lalpur and Dahan on the east, Chak Bilga on the west, and Langeri on the south—all plague-infected villages—and therefore not likely to remain free very long. A case of plague was discovered in it on the 14th of April—a girl, named Rahman, daughter of Ibrahim, who was attacked three or four days previously. It is not very clear how the disease entered the village. One story is that two Tarkhans, named Ram Ditta and Sahib Ditta, worked in Natha Khan's house at Langeri, and that both their wives contracted the disease at Dhandhua and died of it. Another story is that these two men used to get food from their friends in Chak Bilga. A sepoy on the Chak Bilga cordon used to help them in this transaction.

10,066. I think at Sanwali, too, the people used to carry loads of wood through cordons to infected houses?—Yes, they pretended to be people supplying wood, and, I think, lime; and in that way they got through the cordons.

10,067. I think in one case a priest used to get through the cordons?—Yes, at Banga.

10,068. Had you a system of passes?—Yes.

10,069. How was that arranged?—There were printed passes of various colours. There were permanent passes which were only given to people like Tahsildars, and Hospital Assistants, whose duty constantly carried them across the cordons; and there were temporary passes which were used by coolies whom we had for taking antiseptics, medicines, and food through the various cordons.

10,070. Did you find that a great many people applied for passes?—It did not matter whether they applied or not. It was only in connexion with the work that we gave passes. There was a quarantine camp, but we found very few people went into it.

10,071. Did you find that a great many people wanted to leave the villages?—No.

10,072. It is not like the case of towns?—No, it is quite different.

10,073. Are villagers quite willing to stay near the village on their land?—Yes. In cases of men, however, who would lose their appointments if they did not get into certain places, we always helped them if we could.

10,074. But in spite of these cordons, is it not the fact that the disease spread to 86 villages?—Yes.

10,075. In the first place did you find that one village infected several others? Could you give us examples of that?—When we first came to the district on plague duty we got isolated villages situated at some distance from one another; and it was only in February that we began to find out that villages near infected villages became infected. After that we found that every village seemed to become the centre of several other infected villages. The villages from which most other villages were infected were: (1) Khatkar Kalan, which infected Birampur, Jhandher Khurd, Khan Khanan and Shikohpur; (2) Shikohpur, which infected Mallupota, Sahlon, Katharon, Kumam, Simul Mazara, and Bika: (3) Birampur, which infected Purkhowal, Dheron, Salh Kalan and Gunachaur; (4) Purkhowal, which infected Rampur Bilron, Balon and Salh Kalan; (5) Mallupota, which infected Mehlgahla, Dahan, Bahrwal and Mazari, while (6) Mehlgahla infected Ladhana-Jhika, Sodhian, Naura and Bhaura. These six villages were, therefore, the direct cause of 26 other villages being infected.

10,076. In some villages, were there not two sources of infection?—Yes.

10,077. Was not that so in Punian?—Yes. In Punian we tried to find out every source of infection we possibly could; but the people were perfectly sure that rats began to die in Punian before anybody was attacked.

10,078. How was the infection carried from one village to the other?—Usually by human agencies, as far as we can make out.

10,079. In how many cases, exactly, could you trace human agency?—In 67 cases.

10,080. By human agency, I suppose you mean either by clothes or by diseased persons?—Yes, certainly.

10,081. Take clothes first. Do you believe the disease was brought to Sotran by clothes?—That is the evidence we got.

10,082. Could you give us this evidence? It is rather important?—This information was got by Dr. Wilkinson. "The infection of Sotran with plague is accounted for as follows: Sukhi, wife of Gainda, Granthi, was a fakirin, and begged from the surrounding villages, including Khankhanan from which she had received clothes before it was cordoned. On March the 8th or 9th, she received some clothes from the house of her sister-in-law, who lived in Pind Mazari in the Hoshiarpur district. On March 13th, three or four rats were seen in her house, in a dying condition, staggering about as if they were drunk. She was attacked with plague on March 18th and died on March 24th."

10,083. Have you any information showing that she had not been exposed to infection again outside the village from March 8th to March 18th?—No, we have not.

10,084. She may have been infected in between?—Dr. Wilkinson gives this information; he collected it. I, too, know about this village, and I can give you some information with regard to it. I went to the village when plague first broke out there.

10,085. What is your opinion? Do you think the clothes infected the rats first, and then the woman?—I do not know; but it looks like it from the evidence.

10,086. But there is nothing to show that she was not again exposed to infection between March 8th and March 24th?—She was an old woman; and I do not suppose she went very far.

10,087. That would be a long incubation period; it is 16 days, unless she contracted the disease from the clothes?—That is what one thinks. The infection may have been either from the clothes or from the rats.

10,088. I think you had another case at Mahrampur, a man called Kahn Das?—Yes, that was so. This information was collected by Dr. Smith. "The first "man to get ill was Ram Singh, son of Dial Singh, a "Tarkhan. It is generally admitted that he was in the "habit of going into Sahlon, the neighbouring village, "in which plague was rife at that time. He is said to "have brought clothes out of Sahlon belonging to a "Sadhu, named Kahn Das. In Mahrampur, two "Sahdus, named Kahn Das and Kishan Das, have a "home in common. When plague broke out in "Shikohpur and in Sahlon later on, the latter village "determined on a solemn reading of the Granth to "avert the evil. Kahn Das was asked to act as reader "and he went to Sahlon, and after performing the "religious rites, stayed a while longer in the village. "Kahn Das, amongst other things, received, as is "customary, for performing paths, many presents of "clothes from the relatives of the deceased in whose "memory the path is performed. The Ram Singh "above-mentioned, a pupil of Kishan Das, is said to "have broken the Sahlon cordon in order to see a "relative named Hira Singh who lived in Sahlon. "Kishan Das, brother of Kahn Das, was at this time "occupying an out-house of Ram Singh, for the pur-"pose of performing a path for a neighbour of Ram "Singh. Ram Singh is said to have at this time gone "to Sahlon—breaking the cordon—mixed with the "people and brought back the cloth which Kahn "Singh had got for performing the ceremonies in "Sahlon to the home of the Sadhus whose pupil he "was. Sahlon at that time was having six or seven "attacks of plague daily. From Ram Singh's house.

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"the disease spread over the village in a wandering "fashion. It was turned into camp early before the "disease had time to fasten on any quarter in a "wholesale fashion. I think this is again fairly "conclusive evidence of human agency."

10,089. Have you any facts to show that the clothing this man brought back had been used for burying plague people or for funeral ceremonies?—This is information given by Dr. Smith; I am not responsible for it at all.

10,090. What was the other place?—Dahan.

10,091. Will you give us some details with regard to that?—Dahan is a small Jat village situated to the north of Mallupota, from which there is little doubt that it received its infection. An attempt was made to hide the fact that plague was present, and when on March 13th, the disease was discovered, no less than 5 cases and two corpses were brought to light in the village, and more cases occurred before anything could be done. The first case appears to have been a Lohar woman named Ram Kaur, whose dead body was seen by us on our arrival. Ram Kaur's mother, Khemi, wife of Bhana, was subsequently attacked and died. It appears that another Lohar, named Kahna, had previously brought clothes and property from Mallupota just before that village had been cordoned, and deposited them in Ram Kaur's house. If these were the causes of the epidemic, it will be noticed that there was an interval of 23 days between the time the clothes were brought on February 12th and March 7th, when Ram Kaur was attacked.

10,092. A number of dead rats were found, I believe, subsequently, in this house, and in the neighbouring ones when they came to be disinfected?—Yes.

10,093. Was there not a similar case in Parowal?—Yes.

10,094. At page 27 of your Report,* you say, "Under "favouring circumstances, clothes can keep the germs of "the disease alive for an indefinite period." What evidence have you got for that statement?—I have given the evidence about the case I knew about in Bombay, which occurred when I was down there. It was the case of a Parsee family living in Bombay. I think it was in October, when they had a case of plague in the house, which was sent to the hospital, and the people themselves ran away, leaving Bombay altogether. They were away until the spring, when they returned. There had been no other case of plague at all in the family, but the following day, after returning to the house, another member of the family was attacked in the same house.

10,095. (*Prof. Wright.*) You say a member of the family got plague the day after returning to Bombay?—I think it was the next day.

10,096. (*Dr. Ruffer.*) Is that the fact on which you base your statement?—That is one case. We have got other cases in which people have gone back into their houses before they have been disinfected, in some cases as much as 34 days have elapsed, and they have been attacked. I say "indefinite," because I do not know how long it can last. We do not know what the limit is.

10,097. Did you see any cases of *pestis ambulans?*—Yes; we saw some very mild cases. I think they were undoubtedly plague. I do not think it is a good thing to give it a different name.

10,098. Do you think a case of *pestis ambulans* can communicate the disease to another person?—We always treated it on the supposition that it could.

10,099. That is sound enough; but, as a matter of fact, do you believe that it can?—There is one case, that of a boy at Gobindpur, who had a very mild attack of plague, so mild, that he did not go to bed; and yet it seems from the evidence conclusive that he must have spread the disease in the village. The man infected from this boy was a bad case.

10,100. Why do you think he gave it to the village?—Because we could get no other evidence that anybody else brought the disease to the village.

10,101. But you said in the first part of your evidence that you could not say for certain whether a given case was the first or not?—We knew that this boy had been with a plague patient in another village. We knew he had been ill, and we know that the person who lived next door in the same compound got a bad attack of plague and died of it. We could get no evidence that this man who died of plague had left the village.

10,102. Could he not have brought this in his clothes?—Still, he is conveying the disease.

10,103. How can a patient (a pure bubonic case) with *pestis ambulans* communicate the disease to someone else?—I do not know. I wish we did know.

10,104. Is it a fact that one method of transmission by women may be certain religious ceremonies?—It is possible.

10,105. Can you tell us what the ceremony or custom is?—It is simply this. When the person (it may be a man or woman) has any inflammatory swelling with a great deal of pain, a lot of people collect around and each in turn touches the swelling with his or her garments, generally the chaddar or the frock; the idea being that they will disseminate this pain and inflammation over a large number of people who will have very little discomfort from it themselves, it being so diluted, and the persons themselves will get relief.

10,106. May not a large number of women thus come into communication with a plague patient, and possibly spread the plague?—Yes.

10,107. You are of opinion that in the large majority of cases the disease is conveyed by human agency; do you not believe that the disease may be communicated by the agency of rats?—We have a certain number of cases in which the evidence seems to be in favour of the disease being communicated by rats; but the evidence is not complete. One point which I tried hard to get, and which I was never able to do, was the catching of the rats in transit from one village to the next; but short of that evidence there is a great deal which I think points to the fact that rats may carry the disease from one village to another.

10,108. Did you find that rats carried the disease from one village to another?—In a few villages it looked like it.

10,109. Could you tell us the name of these villages, and the facts upon which you base that opinion?—At first we could get no evidence of this kind at all, and it was not until the beginning of April that we got anything that pointed towards it. The first case we had was the case of the village of Chak Kalal. That village is situated amongst several other villages infected with plague. It was so shut in by plague villages that I suggested to the Assistant Commissioner that he should turn out the village in anticipation of plague, and disinfect it at the same time as we disinfected the other villages.

10,110. I think on April 15th, the people went back to their houses?—Yes. They went out into the camp on April 5th. We put no cordon round their village. A storm came on on April 16th, and they went back into their village. The Lambardars came and said that they found a lot of dead rats when they went in. I asked them to bring me one. The following morning they brought me a rat that had just died. I examined it. The spleen was full of typical plague bacilli. I afterwards made cultivations, which grew on agaragar. On microscopical examination we decided that the rats were dying of plague. The following day (the 17th) they brought us in information of people who were suffering from plague. There is one thing, I think, which ought to be mentioned, namely, that some time before a man had been over to Sotran, an infected village, but this man I kept under observation, and the whole of his family. I had them out in camp. I believe really that he did not bring any infection at all, because neither he nor any of his family were ever attacked. Moreover, the Lambardars had a spite against this man. They wanted to get him into trouble. They never suspected that it was possible for rats to bring the disease from one village to the next. They tried very hard to get some explanation of these rats being infected.

10,111. Do you think that there is a possibility of this village having been in communication with another village, and getting infected in some other way?—Rats were dying 10 days before anybody was infected.

10,112. Supposing this man brought in clothes, might he not have infected the rats through clothes?—It is possible; but I have no evidence upon that point.

10,113. Human agency is not absolutely excluded in that case?—The rats died first in all these four villages—Panian, Sotran, Gosal, and Chak Kalal—and all about the same time. It seems to me a very strong

* Not printed with the Commission's Proceedings.

possibility that the rats were generally infected in these four villages, which are situated close to each other. Hamirowal, the next village to Punian, had no plague cases, but rats in it died of plague. In Punian Dr. Wilkinson found two sources of infection; but still in spite of that the people of that village said that the rats died first. Another thing about Punian is that it is a Jat village, and next to it is this little village Hamirowal. Dr. Wilkinson turned this village out at the same time as he turned out Punian. In this village the people are Muhammadans, a different class of people altogether from the Jats who live in Punian. In Hamirowal rats died; they found 28 dead rats.

10,114. When did the rats begin to die?—When the people went out.

10,115. At that time Punian was already infected?—Yes.

10,116. Is there no possibility of human agency?—There is a possibility, but we could not find it. The same with Sotran. It is a village which lies between these two other villages. In that village rats were first infected. Then we had the case of Chak Bilga, in which rats died first. There is a possibility of human agency there; in fact, the boy who was first attacked was a Tarkhan, which is the same caste as the people attacked in the next village. There the rats died before anybody else; so much so that the people themselves asked to come out into camp directly I declared it was a case of plague. They said, "Rats "are dying in the village; we know that when this "happens a great many people get attacked." Then there is another case which I should like to mention, the case of Banga Dispensary. It is an isolated building, situated, I should say, about 200 yards from Banga itself. It is an outlying building. It is situated at the south-east; the infected part of Banga, at the time, was the north-west. I, myself, found one dead rat at the south of Banga. I saw a rat actually die in the road. I picked it up, took it home and examined it. I had lots of rats brought to me. On the 21st of April I went to the hospital and the compounder told me that a rat had just died in a suspicious way in his quarters. I had the rat sent down to my quarters for examination, and I turned out the whole hospital into camp. Afterwards, when I examined the rat, I found it had died of plague. During the next two or three days several other dead rats were found. In this case the Hospital Assistant was a Muhammadan and of quite a different caste from anybody in the north of Banga. He assured me, over and over again, that he had had nothing to do with the people there, and I do not believe that he had. He was an old man with his family. In that case I tried very hard to find some other source of infection but I could not find it.

10,117. I suppose when a person picks up a dead rat he can easily catch plague; but, short of that, how do you think a dead rat can infect a human being?—These rats die in the people's houses, and often die on their clothes.

10,118. Do you think they contaminate the clothes or ground by their urine or by their dejecta?—I do not know what the actual means of transference is. We had a great many cases where rats died in large quantities in blocks and buildings where everybody in those blocks and buildings were afterwards attacked regardless of caste and occupation.

10,119. Do you find that the rats actually wander outside the village?—There is that one case where they went to the well.

10,120. Could you give us the details of that case?—This is reported by Dr. Smith:—"Malpur is about "200 yards from Mahrampur. Plague in Malpur was "discovered early, there being but nine cases in all. "They went into camp on the 9th April. All we can "find out about this village concerning the first case "is that the patient's husband was a frequent visitor "to Mahrampur across the cordon, and that plague "cases were occurring at the time in Mahrampur "camp. The only instance in this circle in which "there is any evidence of rats wandering outside the "walls of the village is the following:—The Chamar "Camp was outside the village close to the walls of "their own quarter. The well which they were using "was under the wall of their own quarter and outside "the village. They requested that another well might "be given to them as they had observed a number of "rats running about the well, and that they ultimately "plunged into the well and were drowned. This is no "evidence of migration. Rats drink water as other "animals do, while in health. These rats were presumably in the feverish stage of the disease previous "to the onset of delirium, and like all animals in this "stage of any fever, they were intensely thirsty and "went to the well they were accustomed to go to for "water. Rats usually go out to drink at night, but "the stress of the feverish thirst may have impelled "them to go in the day time in this instance. That "they jumped into the well I think admits of doubt; "but if they did, it can only be inferred that they "were determined to allay their thirst at any cost. "This incident is no evidence of migration."

10,121. At Kariha, I believe, the rats died all over the village?—Yes.

10,122. But was not the village divided into five factions which did not communicate with one another?—Yes. I know Dr. Smith does not believe in the rat theory at all.

10,123. I want your opinion?—Plague was discovered in Kariha on the 19th April. The people of this village refused to go into camp until the 30th April, and were not all completely out till the 3rd May. The approximate number of deaths before the village was turned out were 126. In this village there are five factions with a Lambardar each. Three of these factions are actively hostile to the other two, and do not associate with them. The disease broke out amongst the latter two factions who occupied about one-third of the village. Amongst the former three factions there were but 15 houses attacked when the village went into camp.

10,124. The following are Dr. Smith's objections, I think:—"If the disease had exhausted itself by this "time how was it that two factions were decimated "and the other three factions living side by side with "them practically escaped? If rats to any practical "extent at all carry the disease from place to place, "in so far as infection of human beings is concerned, "why was the disease in Kariha confined to the "quarters of, practically, only two of the five factions?"—They are Dr. Smith's objections.

10,125. Have you an answer to Dr. Smith's objections?—We know the disease had not exhausted itself, because later on people who went back, 34 days afterwards, into the village to get things were infected. The probability is that the disease was only spreading slowly, as it does, from one quarter to another. They happen to have got it at the time when it had only got that distance, but it was spreading on beyond the boundaries, as you will see by the map.

10,126. It spread afterwards?—Yes. They happen to have got it at the time when it had only spread into those two pattis. If it had only been communicated by human agency, the chances are that it would have appeared in houses dotted about all over the village, in spite of the feud.

10,127. Were there any villages in which many people were infected without an increased mortality among rats?—Yes, in the autumn we got very little evidence of rats dying at all, but in the spring we got overwhelming evidence of rats dying all over the place.

10,128. But still may you not get an epidemic of plague in a village without the rats being infected at all? Was that not the case at Bika?—Yes. This question concerning rats is very difficult, because you have to exclude all other evidence, and the people themselves do not observe the rats much.

10,129. These different factions which you spoke of lived in different quarters of Kariha, did they not?—Yes.

10,130. You have cases at a place called Lehl where dead rats were found in houses before anyone was attacked?—Yes.

10,131. And at Lidhar Kalan?—Yes.

10,132. Can you tell us the facts there?—They are reported by Dr. Wilkinson.

10,133. Can you tell us anything about women in a village being infected before men?—We had a great many cases where plague attacked women first. In Lalpur, I think, only women were attacked first.

10,134. Can you give us the facts about Lalpur?—Yes, The first eight people attacked were all women, and as these observed strict pardah they are not likely to have brought the disease from the other

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villages. There is story to the effect that one Dewa Singh, a small Julaha, of Dahan (an infected village), placed his property in the house of a man named Nawab. The woman Kaki lived in this house as well as Jan Bibi, who was attacked on the following day. But this does not account for Basri's attack, earlier in the day. Basri lived in another part of the village.

10,135. Was not Bisla a similar case?—Yes.

10,136. Do you know whether animals, besides rats, get the plague?—At Banga, in the second muhallah, they told me a squirrel died, but they could not produce it. It is a curious thing that no mice were attacked. In the Punjab we have not the ordinary mouse (*Mus Musculus*), we have the Persian variety (*Mus Bactrianus*), and we had no cases among them, nor had we any cases among what are called musk rats (*Crocidura Cœrulea*), the house shrews. Cases may have occurred among them, but never came to our knowledge.

10,137. Do you know whether dogs get attacked with plague?—No.

10,138. How about monkeys?—There were no monkeys in the district where we had plague.

10,139. Could you mention any facts showing that in an evacuated village the plague spreads from house to house?—The case I gave you before of Mehlgahla. I have given that in detail already. The point was that the Chamars only were attacked when we turned the village out. Afterwards the disinfecting gangs were attacked in each new patti disinfected. Large numbers of dead rats were found also all over the village when the men were working—none when the people left. The disinfecting gangs were attacked at the north-east corner of the village, and the Chamars themselves lived in the south-west corner, and the village contained 4,288 inhabitants. It was a large village, and the infection seems to have spread after the people left the village.

10,140. In that village are you certain you got hold of all the first cases? How do you know that the rest of the village had not been infected?—Because we had them out in camp under observation for some time.

10,141. But before they went out there might have been cases dropping about the village?—In that case we should have expected dropping cases to go on among them after they went out into camp, but we got no cases among them at all; they remained perfectly free until we began the disinfection of the village, and then it was the people who were disinfecting the village who were first attacked.

10,142. How do you think the disease spreads from place to place in an evacuated village?—I think it must be rats.

10,143. Have you any other cases in which you found that the infection remained for a long time in an evacuated village?—Yes, in Khankhanan. The people were turned out on the 6th of December, and some people who went back into the north part of the village to do the disinfection were attacked about January the 7th, 8th, and 9th.

10,144. In that case do you think that was also spread by rats, or have you any other theory to account for it?—I have no other theory to account for it. I ought to mention that these people last infected out in camp were living in different huts separated from each other, but when we went to look at their houses in the village we found they were all close together.

10,145. Did you not make similar observations at Mallupota? Can you give us any facts?—The disease seemed to have stopped when the people got into camp, but unfortunately some Chamars got infected when on disinfection work on the village, and spread the disease in their camp. This was promptly taken in hand by Dr. Fatteh Chand, who disinfected the camp and moved it to a fresh site. After this the disease stopped.

10,146. And at Bahrwal there was a similar case also?—Yes.

10,147. In all these cases can you exclude with certainty the presence of any other cases in the village?—Yes, because these are small villages, and they were examined twice a day, morning and evening. There was a roll-call twice every day.

10,148. But at Kariha, for instance, is it not a fact that when you turned the villagers out you found a great many more cases than you suspected?—Yes.

10,149. Could not that have been the case in other villages?—Yes, but when we got them into camp we had them under our eyes, and they could not go on hiding cases for long.

10,150. But before you turned them out may there not have been undiscovered cases?—Yes.

10,151. So that there may have been several foci of infection in the village which you did not know of?—Yes.

10,152. Still, you think that in the majority of cases the disease was carried from one point of these villages to another in the same villages by rats?—In these particular villages, yes.

10,153. Have you had some experience as to Haffkine's prophylactic inoculations?—Yes.

10,154. In the first place did you find any evil results following Haffkine's inoculations?—Temporary discomfort, but I found no permanent or serious results among the cases I did.

10,155. Did you hear of any bad cases?—Not in our districts.

10,156. Did you get any abscesses?—Yes, one abscess.

10,157. Was that due to the fluid or to some technical fault on the part of the operator?—It was a case I inoculated myself, and I took the same precautions as in other cases. If it were due to the fluid we ought to have got a number of cases of abscesses.

10,158. Did you ever have to reject any of Haffkine's fluid on account of its being putrid?—No.

10,159. Did you ever notice any signs of putridity?—No, we had none that had any smell or anything of that sort.

10,160. How did you standardise Haffkine's fluid when you received it?—I was guided by his own directions on the bottle, stating whether it was half strength or two-thirds strength. We inoculated a certain number of people, and if we found the symptoms were severe we reduced the dose; if, on the other hand, the symptoms were mild, we increased it.

10,161. Did you find it produce a temperature of 102, or a higher temperature?—We got a temperature of 102.

10,162. Did you ever get a temperature of 105?—No.

10,163. How did you standardise the fluid for children?—We used the directions given by Haffkine, using the decimal point. Supposing there was a child six years old we took the standard solution as being ·6, and then multiplied by the number of times it was to be diluted in the directions on the bottle.

10,164. Did you ever inoculate people twice?—Yes, I have given a number of cases in my report* which we did twice.

10,165. Did you find that people objected to coming twice?—Yes, in a great many cases.

10,166. They do not like a second inoculation?—No. For instance, we inoculated in the Banga circle 2,408 people, and only 193 turned up for a second inoculation.

10,167. At Khatkar Kalan you did some inoculations. Can you give us some details of that?—Yes, it was a large camp of 600 people. After they had got into camp I inoculated 209 people between the 5th and 8th of November. Among those I believe I inoculated a man with plague on him. He recovered all right, but it was a case of which I was at first doubtful.

10,168. Did you get any cases of plague among the uninoculated?—No. We only had that one case of plague afterwards in that camp.

10,169. So that the experiment did not prove much?—It proved nothing.

10,170. And at Banga?—Yes; there we had a more extended trial, because Banga was not turned out for a long time afterwards. We began inoculation on the 11th March, and the whole village was not turned out till the 30th April.

10,171. How many people does it contain?—4,917.

10,172. Could you give us the full details of what you did at Banga?—Yes. Banga is situated on the high road half-way between Phagwara and Nawashahr. It contains 4,917 people (actual census taken in March last), and as it is the central market-place for all the villages in this part of the Jullundur District, it was felt that if

* Not published in the Commission's Proceedings.

plague increased it was pretty sure to get to Banga. In fact, a little village called Khatkar Khurd, only half a mile from the town, had already got attacked. It was, therefore, decided not to wait for actual cases, but to start prophylactic inoculations. Accordingly more prophylactic medium was indented for, and March 11th was fixed for the first day of inoculations. Curiously enough, the first case of plague was discovered on the same day. Only eight people presented themselves, but one of them was the Zaildar of Banga, and another the President of the Municipal Committee. No uneasiness was, therefore, felt as to the possibility of inducing people to come forward. It was, however, thought advisable to wait a day after the first day of inoculations in order to allow the rest of the people to see the effect of the treatment on those first inoculated. On the 13th, 24 people came up for treatment, and after this date, whenever we had spare time, we went into Banga and did inoculations. But as new plague villages were springing up on all sides it was often difficult to get time to do all who wished to be done. In spite of this, 2,408 people have been inoculated in this district, and over 1,000 inoculations have been done in Banga town, but only 865 people actually lived in the town. At that time it was not cordoned off, and there were a lot of people passing through, therefore we inoculated many people who did not really live in Banga. Only 865 people actually lived in the town. Table 7 in my report (pp. 134–5),* gives details according to villages, castes, and sex. It will be seen that the largest number of people were done in Banga town, and the villages of Dasanjh (not Dasanjh Kalan), and Thandian, but in the two villages no plague occurred, and we have, therefore, not been able to draw any deductions from the inoculations done in them. The actual villages in which the operations were performed were Khatkar Kalan, Banga, Katt, Chak Bilga, Thandian, Dasanjh, Pharala, Raipur, Punian, and Gunachaur. The inhabitants of the other villages named in the table came chiefly to Banga for inoculation. It will be noticed that 134 people came from Karnana and were inoculated at Banga. In Banga the inoculations were carried on on a larger scale, and consequently the results are of more value. The conditions were these. On the day the first inoculations were done, the first muhalla, containing 87 people, was evacuated. On subsequent dates more cases were discovered, and more people were turned out in the following manner:—

March 28th	- 203	people	were	placed in camp.
April 7th	- 249	,,	,,	,,
,, 16th	- 64	,,	,,	,,
,, 18th	- 56	,,	,,	,,
,, 19th	- 56	,,	,,	,,
,, 20th	- 28	,,	,,	,,
,, 23rd	- 28	,,	,,	,,
,, 25th	- 14	,,	,,	,,

On April 27th the commencement of the evacuation of the whole town took place. This was completed on the 29th. Besides this, about 150 people left the village and went into camp of their own accord in the various gardens round the town before the 27th. Up to the 29th there had been 70 cases with 36 deaths in Banga. While the muhalla system was being carried out, each time a section of the town was evacuated a small cessation in the cases took place. The disease soon ceased to spread in the camps, but reappeared in the town in portions still inhabited, but usually somewhere near the last muhalla evacuated. The general tendency of the disease was to increase. After the whole town was evacuated plague soon stopped, and, not counting a hidden case found on June 26th, and which had been ill several weeks when found, the last case occurred on May 17th, *i.e.*, 18 days after evacuation. The last case was one which the Hospital Assistant saw every day, but he was a new man, and did not recognise it as a case of plague. 33 cases and 29 deaths took place after the town came out. Inoculations were performed between March 11th until the people came out into camp on April 30th. Another 103 cases of plague occurred with 65 deaths, making a percentage of 2·18 of the whole population attacked, with a mortality of 63 per cent. Taking the inoculated people, 865 in number, six were attacked with plague, all had the disease very mildly, and none died, making a percentage of ·693 attacked with a mortality of 0 per cent.

10,173. Then I think you can give a table in order to answer the objection that these people might not have come from the same place. You put in Table No. 9, from your Report,* showing the number of persons inoculated and uninoculated in each of the houses attacked with plague in Banga town?—Yes, it is as follows:

* Not published in the Commission's Proceedings.

TABLE No. IX.

TABLE showing the NUMBER of PERSONS INOCULATED and UNINOCULATED in each of the HOUSES attacked with PLAGUE in BANGA TOWN.

Serial No. of Family.	Inoculated Persons in the Family.				Uninoculated Persons in the Family.			
	Unattacked.	Attacked but Recovered.	Attacked and Died.	Total.	Unattacked.	Attacked but Recovered.	Attacked and Died.	Total.
1	2	1	—	3	—	—	2	2
2	2	—	—	2	4	—	4	8
3	1	—	—	1	—	—	3	3
4	—	—	—	—	—	—	1	1
5	2	—	—	2	1	—	1	2
6	5	—	—	5	6	—	1	7
7	—	—	—	—	3	1	1	5
8	2	1	—	3	—	—	—	—
9	1	—	—	1	3	1	1	5
10	—	—	—	—	1	1	—	2
11	—	1	—	1	1	—	2	3
12	—	1	—	1	2	—	1	3
13	—	—	—	—	1	1	1	3
14	1	—	—	1	3	1	—	4
15	—	—	—	—	2	1	—	3
16	4	1	—	5	3	1	1	5
17	1	1	—	2	1	1	1	3
18	—	—	—	—	3	1	—	4
19	—	—	—	—	1	1	1	3
20	—	—	—	—	1	1	—	2
21	—	—	—	—	—	3	1	4
22	3	—	—	3	2	1	—	3
23	2	—	—	2	2	1	—	3

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TABLE No. IX.—*continued.*

Serial No. of Family.	Inoculated Persons in the Family.				Uninoculated Persons in the Family.			
	Unattacked.	Attacked but Recovered.	Attacked and Died.	Total.	Unattacked.	Attacked but Recovered.	Attacked and Died.	Total.
24	—	—	—	—	1	1	—	2
25	—	—	—	—	—	—	2	2
26	—	—	—	—	4	1	—	5
27	1	—	—	1	2	2	—	4
28	—	—	—	—	6	1	—	7
29	—	—	—	—	—	1	—	1
30	6	—	—	6	1	1	—	2
31	3	—	—	3	3	—	1	4
32	—	—	—	—	1	1	3	5
33	3	—	—	3	3	—	1	4
34	1	—	—	1	8	1	1	10
35	—	—	—	—	5	—	—	5
36	—	—	—	—	—	1	—	1
37	1	—	—	1	1	—	3	4
38	1	—	—	1	1	—	1	2
39	2	—	—	2	—	1	1	2
40	—	—	—	—	—	—	1	1
41	1	—	—	1	9	—	1	10
42	—	—	—	—	7	—	1	8
43	1	—	—	1	4	—	—	4
44	2	—	—	2	5	—	—	5
45	1	—	—	1	4	—	—	4
46	1	—	—	1	3	—	—	3
47	—	—	—	—	2	—	1	3
48	1	—	—	1	1	—	1	2
49	—	—	—	—	5	—	1	6
50	1	—	—	1	—	—	—	—
51	—	—	—	—	6	—	1	7
52	—	—	—	—	5	—	1	6
53	—	—	—	—	1	—	1	2
54	—	—	—	—	3	—	2	5
55	—	—	—	—	1	—	1	2
56	—	—	—	—	1	—	1	2
57	1	—	—	1	—	—	1	1
58	—	—	—	—	3	—	1	4
59	—	—	—	—	5	—	1	6
60	—	—	—	—	2	—	1	3
61	2	—	—	2	7	—	1	8
62	—	—	—	—	7	—	—	7
63	2	—	—	2	1	1	1	3
64	1	—	—	1	1	—	—	1
65	3	—	—	3	1	—	—	1
66	6	—	—	6	—	—	—	—
67	1	—	—	1	1	—	—	1
68	—	—	—	—	2	—	1	3
69	—	—	—	—	—	1	—	1
70	—	—	—	—	—	—	1	1
71	—	—	—	—	—	—	1	1
72	—	—	—	—	—	—	1	1
73	—	—	—	—	—	—	1	1
74	—	—	—	—	6	1	—	7
75	—	—	—	—	6	1	—	7
76	—	—	—	—	—	—	1	1
77	—	—	—	—	—	—	1	1
78	—	—	—	—	3	—	1	4
79	—	—	—	—	1	1	1	3
80	—	—	—	—	1	—	1	2
81	—	—	—	—	4	—	1	5
Total -	68	6	—	74	184	32	65	281

Total in camp, 355.

10,174. I suppose you have notes of all these cases?—Yes.

10,175. Can you give us the age of these people, the inoculated and uninoculated?—That I cannot give you now.

10,176. Is it your opinion that the same classes of people get inoculated in the same houses, or do the masters get inoculated and the servants not?—No, in these houses the people are all of the same class.

10,177. Do you think as many old people get inoculated as young people? The reason I ask is this. Will you look at your Table 10, which is as follows:—

TABLE No. X.

A FULL LIST of all OCCURRENCES of PLAGUE in HOUSES inhabited by PERSONS inoculated against the PLAGUE in BANGA TOWN.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack, with the Dates of their Inoculation. Name, Sex, and Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Disease, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, and Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
1. *Banga, Chabutra ka mohulla* The household consisting of five persons was moved out into camp on March 29th, 1898. (No. 1 in Table No. IX.)	*Unattacked.*—Nathu, son of Ralla Ram, M., æt. 25 years, Brahman. Inoculated on March 20th, with 1¼ *c. c.* standard strength (Reg. No. 364), nursed Surtu during his illness, escaped. *Attacked.*—Surtu (called Bishan Das), son of Ralla Ram, M., æt. 12 years. Inoculated on March 25th, with 1¼ *c. c.* standard strength (Reg. No. 618), attacked with plague 10 P.M., March 31st (six days after inoculation), gland in left axilla. Delirium. Mild attack. Discharged April 20th (twenty days illness).	*Unattacked.*—1. Rama, son of Ralla, M., æt. 20 years, Brahman. This man was inoculated after coming out into camp. *Attacked.*—1. Ralla, son of Khema, M., æt. 53 years, Brahman. Attacked at noon, March 31st. Died April 1st, 3 P.M., severe fever, delirium, no glands. 2. Hukam Dai, wife of Ralla, F., æt. 40 years, Brahman, attacked at 6 P.M., April 1st, died April 6th. High fever, collapse, gland inguinal.
2. *Banga, Mohulla Chabutra* (No. 8 in Table No. IX.)	*Unattacked.*—Birja, son of Nihal Chand, M., æt. 38 years, Brahman. Inoculated with 2½ *c. c.* on April 14th (Reg. No. 842) standard. 2. Mamon, wife of Eidu, F., æt. 40 years, Muhammadan. Inoculated with 2 *c. c.* on April 14th (Reg. No. 855) standard. *Attacked.*—1. Lachman Das, son of Birja Mal, M., æt. 14 years, Brahman. Inoculated with ¾ *c. c.* on March 20th (Reg. No. 385), attacked on April 21st (after one month); mild attack. Gland left inguinal. Discharged May 31st (one month's illness).	Nil.
3. *Banga* - - - This water-carrier lived by himself in the town; but with a family. (No. 6, Table No. IX.) in camp.	*Unattacked.*—Nil. *Attacked.*—1. Pala, son of Chhajju, M., æt. 35 years, Jhinwar. Inoculated on April 16th, with 2¼ *c. c.* (standard) Reg. No. 916, attacked on April 24th (eight days after inoculation), an extremely mild attack. Gland in left inguinal region. Discharged on May 10th (sixteen days in hospital).	Nil.
4. *Banga, Nawar Bazar* - (No. 11, Table No. IX.)	*Unattacked.*—Nil. *Attacked.*—Ahmad Feruk, son of Imam Din, Kashmiri, æt. 12 years. Inoculated twice— March 22nd 1 *c. c.* standard Reg. No. 401. March 25th 1½ *c. c.* Reg. No. 401. Attacked on April 25th (one month after last inoculation), very mild attack, gland right femoral. Discharged 23rd June (twenty-eight days in hospital).	*Unattacked.*—Nur Muhammad, son of Ramzan, M., æt. 20 years, Kashmiri. *Attacked.*—Nur Bibi, wife of Ramzan, F., æt. years, Kashmiri, attacked April 23rd and died April 29th, 1898. 2. Ramzan, son of Samander, M., æt. 60 years, attacked April 23rd. Died June 3rd, 1898.
5. *Banga, Chimba Mohulla* - This man corresponds to No. 12 in Table No. IX. He had a separate hut in camp, but lived in the same house as No. 54 in the town.	*Unattacked.*—Nil. *Attacked.*—1. Ganga Ram, son of Labhu, M., æt. 22 years, Chimba. Inoculated on March 20th, with 1¼ *c. c.* standard (Reg. No. 361), attacked April 25th (thirty-five days after inoculation), mild case. Gland in right inguinal region. Discharged May 25th (ill one month).	*Unattacked.*—1. Punan, wife of Ganga Ram, F., æt. 22 years, Chimba. 2. Gulab Dai, wife of Dittu, F., æt. 10 years, Chimba. 3. Thakur, son of Radha, M., æt. 27 years, Chimba. 4. Nikka, son of Jeon, M., æt. 27 years, Chimba. 5. Malan, wife of Thakur, F., æt. 10 years, Chimba. *Attacked.*—1. Dia Banti, daughter of Ganga Ram, F., æt. 2 years; attacked on April 28th. Died on May 5th. 2. Radha, son of Nikka, M., æt. 45 years, attacked April 22nd. Died April 28th. 3. Naraini, wife of Radha, F., æt. 40 years; attacked April 27th. Died May 3rd.
6. *Banga* - - Family attacked in Segregation Camp. (No. 17 in Table No. IX.)	*Unattacked.*—Ghasita Ram, son of Sain Das, M., Brahman Acharj, æt. 25 years. Inoculated March 22nd with 2 *c. c.* standard (Reg. No. 456). *Attacked.*—1. Nathu Ram, son of Urjan Das, M., Brahman Acharj, æt. 19 years. Inoculated March 24th with 2 *c. c.* standard (Reg. No. 573). Attacked May 3rd (forty days after inoculation) and was discharged June 6th (thirty-five days in hospital) mild attack. Glands right inguinal.	*Unattacked.*—Pala Ram, son of Gobind Ram, M., æt. 48 years, Acharaj. *Attacked.*—1. Matab Kaur, wife of Urjan Das, F., æt. 60 years, Acharaj. Attacked Died May 1st. 2. Jatto, wife of Sain Das, F., æt. 40 years, Acharaj. Attacked May 13th. Recovered June 6th.

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You will find from this table a certain number of people who did not get inoculated, and who died, and I think you will find they include all those over 50. Ralla, for instance, was 53 years of age; then Ramzan was 60 years old; then Matab Kaur, the wife of Urjan Das, was 60. There we have three people advanced in years, and on the other side we do not find any old people among the inoculated?—Yes, I can give you the ages of the inoculated people, if that is what you want, but I cannot give you them exactly amongst these same houses. I can give you the general ages taken from the tables of Banga town.

10,178. That will do, if you will give us the ages of the inoculated people?—Here are the tables:—

TABLE showing the AGES of the INOCULATED PEOPLE at BANGA.

Up to 5 years.	6–10 years.	11–20 years.	21–30 years.	31–40 years.	41–50 years.	51–60 years	Over 60 years.	Age unknown.	Total.	Remarks.
90	202	237	154	88	46	23	5	30*	865	* The register containing 30 cases has been lost.

TABLE showing the AGES of all the PERSONS attacked with PLAGUE at BANGA.

	Up to 5 years.	6–10 years.	11–20 years.	21–30 years.	31–40 years.	41–50 years.	51–60 years.	Over 60 years.	Age unknown.	Total.
Attacked	9	13	15	20	19	11	15	1	—	103
Died	5	7	7	11	14	8	12	1	—	65

10,179. Do you think that prophylactic inoculations alone could eradicate plague?—No.

10,180. Do you believe that you could get everyone in a village to be inoculated?—No.

10,181. Why do you think that the prophylactic inoculations alone are not sufficient?—The chief reason is that it would be almost impossible to get everybody to be inoculated. I think if you tried to do that you would have very much the same experience as we have with small-pox vaccination; it would diminish the disease to a large extent, but you must have something beyond that, something super-added, such as evacuation and disinfection, which seem to be so efficacious.

10,182. Your general impression of inoculation is that it is useful?—Yes, from my experience.

10,183. Have you noticed any difference in the mortality in villages according to their size?—No, I have not worked that out.

10,184. Will you kindly work that out?—Yes.

10,185. I have a table here which I have worked out which you may use as a basis. I have not worked out the decimals, but I have always taken the lower number. For instance, if it were 2·7, I have taken it as 2, and so on. That is calculated on the roll-call. This works out in this way, that in 25 villages of under 500 inhabitants, 32 per cent. had 3 per cent. of attacks and under; in all the others the number of attacks was over 3 per cent. In 32 villages from 500 to 1,000 inhabitants 56 per cent. had 3 per cent. of attacks and under. In 18 villages with a population between 1,000 and 2,000, 72 per cent. had 3 per cent. of attacks; in 10 villages of between 2,000 and 3,000 inhabitants, 80 per cent. had 3 per cent. of attacks. In other words, the larger the town the smaller the percentage of attacks?—Yes, but of course the percentages go up higher the smaller the figures you have. You are using the same unit, viz., the man, but of course the smaller the number you have got the bigger the percentage will appear. For instance, if you have a village of only 50 people and there is one man attacked, that will give you 2 per cent. of attacks straight away, and it is only once case; that is really a very mild attack.

10,186. That is quite true, but this is a point which struck me in going through these figures. Perhaps, if you will work out this table again you can give us the information, because it is an important point?—Yes, I will do so. (The following table was submitted subsequently by witness:—

Serial No.	Under 500.	Per cent.	From 500 to 1,000.	Per cent.	From 1,000 to 2,000.	Per cent.	From 2,000 to 3,000.	Per cent.	From 3,000 to 4,000.	Per cent.	From 4,000 to 5,000.	Per cent.	Above 5,000.	Per cent.
1	Khatkar Khurd	2	Jhander Khurd	5	Khatkar Kalan	5	Khankhanan	8	Pharala	1	Banga	2	Garhshankar	2
2	Balon	14	Katt	4	Sirhal Qazian	4	Mehlgahla	4	Gunachaur	4				
3	Lakhpur	7	Haphowal	2	Mallupota	7	Kumam	2	Mokandpur	·00				
4	Nurpur	3	Chak Bilga	4	Naura	·000	Aur	1						
5	Sahl Kalan	5	Dahan	9	Heon	·15	Rampur Bilron	1						
6	Sahl Khurd	10	Barhwal	3	Langeri	1								
7	Lalpur	11	Mazari	1	Gobindpur	2								
8	Dhandhua	4	Bisla	5	Ladhana Jhika	1								
9	Mallah	2	Tahrpur	5	Bhaura	·5								
10	Sotran	5	Mazara Nauabad	1	Jagatpur	3								
11	Bika	5	Lidhar Kalan	3	Masani	2								
12	Chak Kalal	13	Khanpur	3	Karnana	2								
13	Aujla	1	Sirhal Mandi	6	Lodhipur	3								
14	Turan	2	Lehl	6	Musapur	1								
15	Mahmudpur	6	Rehpa	2	Kariha	9								
16	Sodhian	6	Goslan	2	Jhingar	1								
17	Punia	13	Malpur	1	Birampur	3								
18	Piragpur	over 10	Chhokran	1	Simul Mazara	4								
19	Bajon	6	Shikohpur	14										

Serial No.	Under 500.		From 500 to 1,000.		From 1,000 to 2,000.	From 2,000 to 3,000.	From 3,000 to 4,000.	From 4,000 to 5,000.	Above 5,000.
		Per cent.		Per cent.					
20	Dheron -	- 3	Sahlon -	- 10					
21	Bhajjal -	- 10	Katharon	- 3					
22	Sadhowal	- 6	Mahrampur	- 6					
23	Parowal -	- 11	Chahlan -	- 5					
24	Sanwali	- 10	Hansaron	- 6					
25	Kalewal -	- 8	Rasulpur	- 5					
26	Bhagwain	- 3	Bhangal -	- 4					
27			Laroya -	- 2					
28			Parkhowal	- 2					
29			Hajipur	- 11					
30			Garhi -	- 11					
31			Chinkoa	- 1					
32			Palewal -	- 1					

(*a.*) Of 26 villages with population under 500, 7 villages or 26 per cent. had 3 per cent. or under of attacks.
(*b.*) Of 32 villages with a population between 500 and 1,000, 15 villages or 47 per cent. had 3 per cent. or under of attacks.
(*c.*) Of 18 „ 1,000 and 2,000, 13 „ 72 „ „ „
(*d.*) Of 10 „ „ over 2,000, 7 villages or 70 per cent. had 3 per cent. or under of attacks.)

10,187. (*Mr. Hewett.*) In the case of Shikohpur, which has a large percentage of attacks, nothing was done for a long time?—That was hidden for nearly two months.

10,188. (*Dr. Ruffer.*) You have also had some experience as to the clinical aspects of the disease?—Yes.

10,189. Can you give us facts relating to the length of the incubation period? I think you observed some cases at Chak Kalal?—Yes. The people were out into camp and went into the village on a particular day, so we know where they got their infection and the time. Usually it is very difficult to find out these points. Symptoms of plague developed in those attacked on the following days, as here shown:—

After 1 day	- None	After 7 days	- 2
„ 2 days	- 3	„ 8 „	- 0
„ 3 „	- 7	„ 9 „	- 3
„ 4 „	- 7	„ 10 „	- 2
„ 5 „	- 1	„ 11 „	- 2
„ 6 „	- 2		

10,190. Up to the 15th you had 17 cases?—Yes.

10,191. Do you think some of these cases may have caught the disease from another patient in the camp?—Yes, they may have done so.

10,192. The majority of cases occurred on the 2nd, 3rd, and 4th days?—Yes, they would probably be those who got the infection directly.

10,193. And you think the other cases caught it from the first?—Of course I do not know, but I admit the possibility.

10,194. You also found that when you evacuated the villages most of the cases occurred immediately after?—Yes, within the first five days.

10,195. What do you think is the incubation period of plague?—I think certainly up to 10 days.

10,196. Have you any well authenticated cases in which a man has developed plague 10 days after being in contact with a plague patient?—We have the case of the girl at Mehlgahla. She attended her mother at Mallupota, and ran away to Mahlgahla. Among the people who were found to have left Mallupota when that village was discovered to be infected was a girl named Shiv Dai, daughter of Nathu, and grand-daughter of Hamera, the Lambardar who was first attacked at Mallupota. The statement of several people is that Nathu's wife, Nahli, died at Mallupota; Shiv Dai, her daughter, who was married to a youth named Jawala, at Mehlgahla, came over to see her mother and remained three days at Mallupota. She left just previous to the village being cordoned on February 12th, and remained well till February 22nd. We were able to trace her to her destination, and Dr. Davidson, who was then Inspecting Officer, paid several visits to Mahlgahla to satisfy himself that she was quite well. On the date named above Shiv Dai complained of fever and pain and swelling in the groin. Her father-in-law, Uttam Singh, in whose house she was now living, immediately gave information to Dr. Davidson, who, after seeing the girl, informed the executive staff.

10,197. Are you sure that she did not bring in infected clothes with her?—No, I am not sure.

10,198. Could you put in Table No. 12, giving the buboes in these cases?—Yes, it is as follows:—

TABLE No. XII.

The position of the buboes in 3,128 cases is given in the following table:—

	Neck.		Axilla.		Groin.		More than one Situation.		Other Situations.		No Glands, including Pneumonic Cases.		Total.	
	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.	Fatal.	Recovered.
Jullundur - -	163	98	175	100	784	617	67	47	26	10	296	110	1,511	982
Hoshairpur - -	49	30	43	25	173	161	19	6	10	6	70	44	363	272
Total - -	212	128	218	125	957	778	86	53	36	16	366	154	1,874	1,254
Total number of cases under each head.	340		343		1,735		139		52		520		3,128	
Percentage of deaths under each head.	62·35		63·27		55·46		61·86		69·23		70·04		59 91	

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10,199. You are of opinion that the more fatal forms do not develop buboes?—Yes.

10,200. What do you think of the mortality in the pneumonic form? Did you ever see a case of pneumonic plague recover?—No.

10,201. Do you consider the pneumonic form highly infectious?—Yes.

10,202. You find that buboes in the axilla are a bad prognostic sign?—Yes, rather more so than in the neck, which I was rather surprised to find in going through the statistics.

10,203. Can you give us some information as to the date of the appearance of the buboes after the beginning of the illness?—Yes. I was only able to collect a few cases, but we had 47 cases in which the notes stated the time at which the disease started and the time of the appearance of the buboes. In four cases the enlarged glands appeared within an hour after the initial symptoms, in five cases in two hours, in eight cases in three hours, in 12 cases in four hours, in one case in five hours, in seven cases in six hours, in two cases in eight hours, in one case in 10 hours, in two cases in 12 hours, in one case in 24 hours, in one case in one-and-a-half days, in one case in two days, in one case in three days, and in one case in 4 days.

10,204. So that the buboes are a very early symptom?—Yes.

10,205. What was the mortality in your cases?—62-73 per cent.; roughly, two out of every three patients died.

10,206. Did you find that patients going into hospital had a much better chance of getting well?—That is the impression I got, but it is very difficult to give you absolute figures. It was very noticeable in one or two villages where they refused treatment that the mortality was high among those attacked.

10,207. On which day of the disease is the mortality highest?—The mortality is very high during the first five days, and highest of all on the second day after attack.

10,208. In Table No. 14 you have given the details; perhaps you will put that table in?—Yes, it is as follows:—

TABLE No. XIV.

Total Deaths.	Mortality, from Day to Day, of the Disease in the Jullundur District.																									Date of Attack unknown
	Day of Disease.																									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	
1,708	207	266	221	209	136	139	107	54	31	21	17	9	7	2	2	4	2	4	1	—	3	1	—	3	—	1	261

It will be noticed that 14·30 per cent., or nearly one-seventh of the cases, died within 24 hours of the attack; 18·38 per cent., or nearly one-fifth, died in the next 24 hours; 15·27, or one-sixth, on the third day; 14·44, or about one-seventh, on the fourth day; 9·40, or about one-eleventh, on the fifth day. The figures were nearly the same on the sixth day. After this there is a great drop in the mortality. In fact 62 per cent. of the cases, or roughly, two-thirds of the patients, died within four days of the commencement of the attack. If the patient lived a week (8 days) his chances of recovery were very great, as only 7·47 per cent. of the cases died after this date.

10,209. Did you ever see a case suffering from a second attack of plague?—No.

10,210. Did you find any difference in the mortality, according to the habits, caste, or age of the people?—No, absolutely none.

10,211. Did you find hæmorrhage to be one of the complications of plague?—There were very few cases really, compared with what I saw in Bombay.

10,212. Did acute pneumonia sometimes set in during plague?—Yes.

10,213. Quite apart from plague pneumonia?—Yes.

10,214. In these cases of secondary pneumonia, did you find the plague bacillus or pneumo-coccus?—We could not make bacteriological examinations for them.

10,215. You found ophthalmia in some cases?—Yes.

10,216. And aphasia?—Yes, we had several cases of that.

10,217. Can you tell us anything about *post mortem* appearances in plague?—No, we did no *post mortems*.

10,218. You had a mixture, I believe, which was rather a favourite mixture for plague; can you give us the composition of that?—Yes, it is as follows:—

Re—Liq. Hydrarg Perchloride	-	ʒj
Liq. Strychniæ - -	-	ɱii
Tinct. Digitalis -	-	ɱv
Rum - - -	-	ʒii
Aq. Ad. - -	-	ʒi

10,219. I suppose the rest of the treatment was merely symptomatic?—Yes.

10,220. (*Mr. Hewett.*) Can you tell us when this man Ram Saran was in Hardwar?—I do not know the exact date, but it was either at the end of March, or the beginning of April—during April probably.

10,221. There has been no plague in Rahon till this year?—No.

10,222. You do not know of any mild cases existing there during the summer of 1897?—No.

10,223. In your report* you say that it was extremely common for a long period to elapse between the arrival of the imported cases and the onset of the first indigenous case?—Yes. There was the case in Mahlgahla where the girl was attacked, and the next batch of cases occurred three weeks afterwards.

10,224. Have you any other illustrations you would like to give?—The following are some instances:—

1. In Khatkar Kalan, as I have already stated, there was probably an interval of two months between the time the imported case Ram Saran died and the next case.
2. The first case at Aur was on 5th April. The second case, 23rd July.
3. Gobindpur. An interval of 37 days elapsed between the time Puran got infected from Sahl Kalan and the time Gondah the first local case got attacked.
4. Dahan. 23 days elapsed between the time that the clothes from Mallupota were deposited in Ram Kaur's house and the time she was attacked.
5. Mahmudpur. First case was attacked on 4th March. Second case was attacked on 10th March.
6. Laroya. First case, Gonda, attacked April 21st. Second case, Ran, his wife attacked May 17th.
7. Jhingar. First case, Mussamat Ishri, attacked 28th April. Second case, Bhola, attacked 23rd May.
8. Birampur. Ganeshi ran away from Khatkar Kalan about October 18th–20th, she died a few days later (not November 5th, as stated by Captain Clarke). The second case occurred November 5th. The third case not till December.

We have less certain evidence of (9) Hansaron, where the first case is stated to be 14th March, and the second 13th April; (10) Bhaura, where there was a long interval, but I have not the dates; (11) Aujla, where we suspected a case of plague on March 20th, but no fresh cases occurred till April 21st. In the case of Masani, a man named Chuhar was attacked on February 24th; another family was attacked between February 28th

* Not printed with the Commission's Proceedings.

and March 3rd, after which there were no new cases till March 27th; the disease did not take on an epidemic form till the beginning of April.

10,225. You say that houses which have their entrances in different streets, and which belong to people who have no communication with one another, are likely to get infected?—We have a great many instances; that was very common indeed.

10,226. How do you account for that?—The only theory is that possibly it is rats.

10,227. You say that plague is far more infectious than any other disease. Do you mean the pneumonic form, or the bubonic form?—I mean, of course, both forms of plague in the houses in which it occurs. In the same way as typhus is very infectious in the locality where it breaks out, so we found in plague, that in the locality where it breaks out, it is very infectious. The means of infection I do not know.

10,228. When you get the people in the segregation camp is it very infectious?—No, it is not.

10,229. You mean that it is infectious in the houses where you find the infection existing?—Yes.

10,230. You had some experience of partial evacuation, had you not?—Yes.

10,231. Did you find it efficient?—No; it generally stopped the disease for a time, only to reappear in the unevacuated portion.

10,232. How many times did you evacuate certain portions of the town of Banga?—I think in nine sections.

10,233. When you evacuated one muhalla in that town, did you find that the infection broke out in the neighbouring muhalla?—Yes, in several cases.

10,234. Had you taken any steps to prevent communication between the evacuated muhalla and the rest of the town?—Yes; we had bricked up the streets and had put on a police guard at the openings where we let the people out. They never went through the village at all from the time we took over the muhalla till the time disinfection was finished.

10,235. Will you please give us at length your experience of the effects of partial evacuation in Banga, putting in the map of the place?—The principal statistics relating to Banga are as follows:—

Census population (1891)		5,010
Roll-call		4,727
Muhammadans		761
Hindus, chiefly Brahmans and Khatris		3,221
Chamars and Ramdasis		569
Sweepers		176
Number of houses		1,600
,, ,, infected		80
Number of plague cases returned		103
,, deaths returned		65
,, recoveries returned		38
Date of first case	7th Mar.	1898
,, ,, returned	11th ,,	
,, declaration of plague	11th ,,	
,, cordoning of village	11th ,,	
,, evacuation of village	30th April	1898
,, commencement of disinfection	11th Mar.	1898
,, completion of disinfection	28th June	1898
,, last case	20th ,,	
,, return to village	29th ,,	
,, removal of cordon	5th July	1898
,, village declared free of plague	9th ,,	

It had long been feared that Banga would sooner or later become infected, and to guard against this, measures were taken as early as December last in order to try and keep out the disease. A carefully prepared list of the inhabitants was made, the Hospital Assistant in charge of the local dispensary was warned to be on the alert, and to give early information, and the burying and burning grounds were carefully watched. The inhabitants were warned not to allow strangers to stop in the town more than was absolutely necessary. This was a difficult measure to carry out, as Banga is the central market for the surrounding villages. It is here that the cultivators bring their vegetables, &c. for sale, and take back salt, ghi, and other necessaries for their homes. The bankers and large shopkeepers have their headquarters and stores in the bazar. It was also the place from which the police on plague duty drew their supplies. On December 30th a Committee, consisting of Bishan Das, the President of the Municipal Committee, Sham Singh, Zaildar of Banga, Sekunder Khan, Zaildar of Heon, Muhammad Bakhsh, Thanadar, and Ghulam Rasul, Hospital Assistant, was formed in order to make daily visits throughout the town, report all suspicious cases of illness, see that drains, &c., were kept clean, houses in a dirty state properly remedied, ventilation holes made in any houses which were dark or overcrowded, and to put down phenyle solution wherever they thought it desirable. The Committee worked with energy, and afterwards, with the help of a nurse, did very good inspection work. At the time there was an epidemic of mumps in the town which caused them anxiety several times, as the disease in its early stages sometimes resembles plague. The first case of the real disease was discovered on March 11th. It was an old woman named Rajji, a Jhinwari, who lived in the Lalaris' or Muhammadan cloth-dyers' quarters. She earned her livelihood, such as it was, by begging, and had lately been in other villages; but it was never discovered from which village she brought the disease. She was quite collapsed when first seen; and though she rallied a little when placed in hospital, she was never able to give an account of her movements, and died two days later. On the occasion of finding this case, the people of Banga turned out in large numbers and almost blocked the road, and put on a very threatening attitude, shouting out at the top of their voices that the case had been imported from another place by one Pir Bakhsh, in order to obtain the reward. It was only after much persuasion, and after they saw that only the muhalla in which the woman lived was going to be evacuated, and that Pir Bakhsh was going out into camp together with the other Lalaris, that they were pacified. There was no foundation for the report that the woman had been brought when sick from another village. Banga being a town, and containing many people of various trading occupations, we realised that it must be treated on rather different lines to the ordinary villages, where turning the whole population out into camp caused very little hardship, except the actual discomfort of people having to leave their homes. In the case of Banga many people would suffer large pecuniary loss by being placed in camp, and many of the traders would lose their occupation altogether. The people, moreover, were noted for being exceptionally troublesome, and the saying that the "Banga log bahut binga hain" was commonly quoted. Therefore, with the sanction of the Commissioner (Colonel Massy), we started at first the muhalla system of evacuation—that is, we intended to turn out a large section of the town each time a case was discovered in it. On March 11th, on discovery of the first case, 87 people were placed in camp. The entrance to the muhalla was bricked up with an eight-foot wall before any one was allowed to move, and the people thus cut off were removed through an opening in the outer wall of the town. On reference to the accompanying diagram* it will be seen that the muhalla was situated against the outer wall at the northern part of Banga, and by the means employed was entirely cut off from the rest of the town. The camp was situated about half a mile away to the north-west, and strongly cordoned. After these people were in camp, two of them were attacked, one four days and the other eight days after removal. The Lalaris after this remained quite healthy, and on April 15th returned to their quarters. On March 28th (17 days after the Lalaris had been out in camp) three more cases were discovered in a muhalla, called the Thatharian, or brassworker's muhalla. The cases were found in two houses, one a Khatri's named Devi Dial, who had two children down with the disease, and the other the son of a Brahman named Billu. On referring to the diagram, it will be seen that the houses are practically situated one on either side of the Lalaris' muhalla. This muhalla had been quite emptied, and all the entrance had been blocked by the wall marked A. Moreover, the Lalaris were out in camp, and were at the time practically healthy, as the two cases in hospital were now convalescent, and besides the Khatris and Brahmans had no connexion whatever with them. The question naturally arises, how were these three children attacked? Certain facts make it likely that rats may have been the cause. A day or two before this, some of the disinfecting gang saw a rat die in the middle of a room in a Lalaris' house in the muhalla first infected.

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* *See* Appendix No. XXXVI. in this Volume.

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The description given made it seem extremely likely that the rat died of plague. The body of the dead animal was placed in a convenient place for our inspection. When we arrived a short time later it had mysteriously disappeared. At the time, a cat, which had been seen shortly before, was supposed to have snatched away the rat and departed. On the morning that Billu's child had been attacked a very offensive smell was noticed in the room, and on investigation a dead and putrefying rat was found. It is not inferred from this that the rat thus found in Billu's house was the same one that had been removed by some unseen agency from the Lalari's house. But, as in the latter case the rat found had died of plague, it is reasonable to suppose that the one found in Billu's house was also a plague rat. At any rate, it is the only hypothesis we have for accounting for the disease spreading from the Lalaris' quarters. In the case of this second muhalla, called the Thatarian's muhalla, or Bashambar Das's muhalla, from the name of the most influential resident, the four entrances on the town side were blocked up by brick walls (marked C in the map) by Mr. Jones exactly in the same way as the first muhalla had been cut off from the rest of the town, and the people were got out into a separate camp in the fields through an opening in the town wall (marked D in the diagram). In this way 203 persons were evacuated, and all the houses surrounding the Lalari muhalla and Devi Dial and Billu's houses were entirely emptied. A police guard was placed over the only remaining entrance (at D) to this area, as had been previously done in the case of entrance B in the former muhalla. The people in camp were also cordoned and had no communication with either the former camp or with the people in the rest of the town. They had 13 more cases of plague after they left their homes, the last case occurring ten days after being in camp. There were two deaths from other causes before they returned to their homes, two months later. On April 7th, a third section of the town became infected. A little Brahman girl, living in a house situated in a muhalla known as Kirpa Ram's, was attacked and died. This muhalla is in reality only a continuation of the lane which forms the principal street of the previous muhalla, and the house in which the case occurred was the next one beyond the temporary wall which had been built to separate the two muhallas. It seems as if after an interval of 10 days the disease had spread from the last muhalla, just in the same way as it had done from the first to the second muhalla, after an interval of 21 days. But in this case we have no evidence to give as to the agency by which it spread. This third muhalla was closed by a wall marked E in the diagram, and the people taken out into camp by an opening made in the town wall at F; 249 persons were placed in a large camp situated at the north of the town; among these there were only four more cases of plague, the last two of which occurred on the 16th, *i.e.*, nine days after being in camp. After this there was another interval before fresh cases occurred, and the muhalla next affected was situated some distance from the previous ones. The cases were a man named Hamera and Jawala his son, both Sunars. They were found on April 16th. Hamera had been attacked two days previously, and his son the previous day. They lived in muhalla Rorian, which contained 64 people. It was immediately evacuated. It appears that Hamera kept a shop (marked thus * in the map) in which a plague rat, seen coming from the direction of the second infected muhalla, had died. A day or two previous to his being attacked the people standing by advised the owner to leave his shop, but he only laughed and had the rat thrown away. Among these people placed in camp, three were attacked on April 22nd, six days after evacuation. On April 17th and 18th, people in three other muhallas in various parts of the town were found attacked, viz., a Sunar in Arti muhalla, a Brahman in Sarga muhalla, and a sweeper in the sweepers' quarters at the south-east of the town (this last is not shown in the map). It now began to be apparent that the muhalla system of evacuation, though carried out with the utmost care and with special advantages—for our first three muhallas had been situated on the outskirts of the town—had failed, and that we must be prepared for an entire evacuation of the place as soon as possible. In the meanwhile we continued to move out small muhallas whenever affected. On this date we moved out 56 people. Only three of these were afterwards attacked, the last case occurring four days after evacuation. On April 19th another Chimba, in another Chimba's quarters, was attacked, as were also two Kalals, one in the Lutian muhalla and the other in Amar Nath's street or Kurian muhalla; 56 people were evacuated and four more cases occurred among the Kalals, the last six days after evacuation. On April 22nd a Ramdasi woman named Premi, living in the Khojian quarter, became ill with fever, and during the night, in a state of delirium, threw herself down the Ramdasis' well and was drowned. It is pretty certain that she had plague. The number of people evacuated on this date is not stated. But no more were attacked. On April 23rd, Dev Raja, Khatri, a boy, was attacked in the Seranda muhalla; 28 people were evacuated and no new cases followed. On the 25th, two Brahmans were attacked in the Chabachra quarter, which adjoined Kirpa Ram's muhalla. The house infected was separated from the wall barrier, placed to prevent entrance to the old muhalla, by another house in which dead rats had occurred. One of these was shown us and was found to have died of plague. Nobody in this house was attacked. This may possibly be due to the fact that they had all been inoculated with Haffkine's fluid. No dead rats were found in the infected house. A third Chimba, from a third Chimba quarter, was also admitted on this day; 28 people in all were moved out into camp, of which only one, Dia Banti, the Chimba's infant child, was attacked on the 28th. On the 26th, a case was found in the Khojian muhalla, opposite to where the Ramdasis lived, and 14 people more were placed in camp. On the 27th, things came to a climax, and no less than 16 new cases were reported, of which 15 had occurred in the town. It was now absolutely absurd to continue the partial evacuations. Consequently all the remaining people were given notice to go out into camps, and suitable sites for the various sections and castes were selected near the groves of trees. The people began going out early on the morning of the 28th, and the town was completely empty by the evening of the 30th. There were eight cases reported on the 29th, three on the 30th, six on the 1st, two on the 3rd, eight on the 4th, two on the 6th, one on the 13th, one on 16th and 17th, when the disease seemed to stop. A case was afterwards discovered in an outlying camp on June 20th, but the man had been ill almost from the day he left the village. A new Hospital Assistant was in charge of this camp and mistook the buboes in the neck for scrofula. The patient made a rapid recovery after getting into hospital, and fortunately no other members of his family were attacked. The accompanying table shows the effect of the evacuation in the various camps.

SHOWING the EFFECT of placing People in CAMP at BANGA TOWN.

DATE.	MARCH. 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31	APRIL. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	MAY. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Cases occurring in the town.	1 – – – – – – – – – – – – – – – – – – – 2 1 – –	– – – – – – 1 – – – – – – – – 2 2 1 2 1 1 – 1 1 3 – 15 1 4 2	Town evacuated between April 28th and 30th.
Cases in Lalari camp.	– – – – 1 – – – 1 – – – – – – – – – – – – –	– – – – – – – – – – – – – – – –	87 persons from the Lilari muhalla were placed in camp on the occurrence of the first case of plague on March 11th. Two cases occurred in camp; after which they remained free of illness and returned to their homes on April 15th.
Cases in Bashambar Das' camp.	203 persons removed into camp on the occurrence of the second case of plague in the village on March 28th.	1 – 1 1 – 2 3 –	– –
Cases in Kirpa Ram's camp.	249 persons were placed in camp on April 7th on account of the third set of cases in Kirpa Ram's muhalla.	– – – – 1 – 1 – 2 –	– –
Cases in other camps.	Families and muhallas sent into camp between April 16th and 30th were made into a large segregation camp near Kirpa Ram's camp. The whole town was evacuated on April 28th and 30th.	4th March – – – 3 5th „ 1 1 – 1 – 2 1 1 – 1 2 – 1 2 4 1	6 – 2 8 2 – – – – – 1 – – 1 1 – – – – –
Total cases	1 – – – 1 – – – 1 – – – – – – – 2 1 – –	5 – 1 1 2 3 2 – – – – 1 – 1 – 4 2 1 3 4 2 5 1 2 5 – 16 3 8 3	6 – 2 8 – 2 – – – – – – 1 – – 1 1 – – – – –

Total cases 103, of which 41 occurred in the town itself, 2 in Lalari segregation camp, 13 in Bashambar Das' camp, 8 in Kirpa Ram's camp, and 13 in segregation and other camps. In the above table one case which was found on June 20th is omitted, as the man had been ill a long time, but was mistaken for a case of scrofula by the Hospital Assistant in charge. The exact date of his getting ill is unknown.

No. 2

MINUTES OF EVIDENCE

99

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From the above description it will be seen that the partial evacuation of the town carried out during March and April totally failed to stop the onward march of the disease. Though large sections of the town were emptied, and brick walls were built across the streets leading to the affected quarters, the disease seemed to slip past us and attack fresh portions of the town. In spite of this, it showed a wonderful tendency to die out in the camps situated in the open, and composed of the families and neighbours of the affected persons. There is strong reason for believing that rats were the cause of this spread. We have already shown that dead rats were found in the dwellings of two of the cases (Billu and Hamera). We ourselves saw a plague-stricken rat dragging its feverish frame along an open street in broad daylight. The street was situated at the south of the town behind a school, a part which up to that time had not been attacked. And yet the microscopical examination of and the culture made from the spleen gave us typical plague bacilli. On the 21st April plague rats were found and examined from the local dispensary, an isolated building about 200 yards to the south-east of the town. The occupants, including the patients, were immediately turned out into a grove, and all escaped the disease. After all the people had left Banga, dead rats were found lying about in the shops situated on the Phagwara-Nawashahr main road. And there can be little doubt that the people whose houses occupied the south portion of the town were saved by having been placed in camp before the diseased rats had reached their houses. The disinfection of the houses was started in March, but not completed till June 27th. The work was most difficult, as there were not only 1,600 houses to be done, but many of them contained numerous rooms stored with merchandise, which required careful taking out, disinfecting and returning. Many of the old bricked houses were in a dilapidated condition, and in some we were unable to make the usual ventilation holes, but had to trust to a plentiful application of disinfectants and limewash. The people were told that they might return to their dwellings on June 28th. But this appears to have been an unauspicious day, and not a soul made a move till the 29th, when 4,900 people returned to their homes. During the previous ten days every camp had been disinfected, and every man, woman, and child had undergone the ordeal of the "phenyle bath." When the time came nothing remained but to give the word, and the people loaded up their carts, and in a few hours every camp was deserted. Heavy rain fell on the evening of the 29th. But most of the people had already closed the mogas, or large holes made by us in their roofs to let in the purifying agents—sun and air. Prophylactic inoculations were done in this town on a large scale. There were 103 attacks in all, with 65 deaths, making a percentage of 2·7 attacked, with a mortality of 63·1 per cent.

10,236. Did you have any difficulty about evacuation owing to weather or other external difficulties, apart from the attitude of the people?—In the rainy time, of course, people were put to great discomfort, and in one case in Mallupota we had half the camp under water one morning.

10,237. Do you think that evacuation is possible on a large scale during the rainy season?—Yes, I think it is. It depends what kind of rain and what part of the country you are in. In the Punjab, it is feasible during the rains.

10,238. You have no black cotton soil?—No.

10,239. Is it very inconvenient to people in the very hot weather here?—Yes, they suffer a certain amount of discomfort, but if we can get trees for them, and shelter, the discomfort is not very great.

10,240. Did you ever burn any of the houses which were infected?—We burnt two houses, one at Gunachaur, and one at Heon.

10,241. Was the result successful?—Yes, in both cases.

10,242. Do you think that any person who really wanted to get out of the village around which a cordon was placed, would have had any difficulty in doing so if he could afford to pay?—No, not if he was prepared to pay for it.

10,243. Would the people who would be the most likely to want to move from one village to another be those who were best able to pay?—Not necessarily. There are some castes whose work would more naturally carry them from place to place.

10,244. For instance, would not the travelling eye-doctors and Banniahs be more likely to move than the ordinary agriculturists?—Yes, certainly.

10,245. And better able to pay?—Some of the Rawals are very poor, they are not generally a rich race although they have rich men among them.

10,246. In March you had a special inspecting staff?—Yes.

10,247. Which was employed for the purpose of ascertaining plague?—Yes.

10,248. And you also had a system of rewards; when was that system introduced?—In March.

10,249. You say you think that it was very successful?—Yes.

10,250. There were some cases in which there was great delay in ascertaining plague after the beginning March?—Certainly. It was not perfect, but it was a great improvement on what we had before.

10,251. Even with this special organization for finding plague you had great difficulties in finding it at times, did you not?—Yes, at times, but it was much easier than it had been before.

10,252. Did you make any attempt at corpse inspection?—Yes.

10,253. How did people regard it?—They did not object in the least, anywhere.

10,254. Where did you try it?—At Banga it was carried regularly on for some time. When I was informed of a suspicious death taking place I inspected the corpse.

10,255. Before plague broke out?—In the village where there was no plague at all.

10,256. The greatest advantage claimable for corpse inspection would be derived at that time, would it not?—Yes. I am speaking of Banga before plague was discovered there.

10,257. You did not carry it out after plague was found?—Yes, in the camps.

10,258. What was the necessity for the quarantine camps which you had?—To allow people who would be seriously inconvenienced by remaining in a district to go away to other districts where their work carried them.

10,259. What sort of people were they?—There were very few people who came to the camps; as a rule they were mostly our own Hospital Assistants and policemen who were being transferred to other districts.

10,260. What was the object of having it? Could not you have observed those people in the districts to which they were going?—Separate arrangements would have had to be made in every district.

10,261. You do not think that that would be feasible?—No, it would involve a great deal more work. It is better that they should be inspected just outside our plague infection area.

10,262. You kept them there for 10 days?—Yes, and then they were disinfected and allowed to go on.

10,263. Did the people show very much fear of plague?—Yes.

10,264. Do you think that this feeling affected the number of cases in any way? Were there more cases where the people were more afraid?—I did not notice that.

10,265. Were the people afraid of the measures taken?—Yes, until they had seen them done. Our new villages were always the ones which gave us the most difficulty, especially those in the outlying districts. They seemed to dread our arrangements very much indeed, but I think in almost every case after they had seen what was done, they were quite satisfied.

10,266. I think you said that you allowed the people to return to a village which had been evacuated three weeks after the last case occurred in the camp?—Yes.

10,267. Was there an alternative when there were still cases in hospital?—We did not allow them to return unless we were perfectly sure that the cases in hospital were only suffering from *sequelæ*.

10,268. You sometimes kept the people out for more than three weeks after the last case occurred in camp?—Yes.

10,269. Do you think that was necessary if you had the man in hospital?—No.

10,270. Do you think that it was necessary to keep them as long as three weeks?—Yes.

10,271. When the people got back after evacuation did they retain these ventilation openings which you had made for them?—No, they closed them up at once—the large opening in the roof. In some cases the whole roof had been removed.

10,272. Have you any details about the establishment employed in the operations against the plague?—The establishment was constantly increasing from October to May. We began with one Assistant Commissioner, one Commissioned Medical Officer, three Hospital Assistants, and three compounders, and about 50 police at Khatkar Kalan, our first village. Then two Commissioned Medical Officers were added, one in the Jullundur district, and one in the Hoshiarpur district, for observation duty. In March the whole of the suspected area was entrusted to a separate observation agency consisting of 10 European officers, five civil and five medical, with a large subordinate staff which replaced the two Commissioned Medical Officers who had originally been employed to seek out fresh centres of the epidemic; and Major Inglis, Deputy Commissioner, Hoshiarpur, was placed on special duty to supervise the whole field of operations under the immediate control of the Commissioner. At the beginning of May the staff employed on plague duty was constituted as follows:—

IN GENERAL CHARGE.

1 Deputy Commissioner on Special Duty.

OBSERVATION STAFF.

Civil.

4 Assistant Commissioners.
27 Tahsildars and Naib Tahsildars.
60 Kanungos.

Medical.

4 Commissioned Officers.*
11 Hospital Assistants.
22 Compounders.
3 Female Practitioners.
22 Dhais.

EXECUTIVE STAFF.

Civil.

8 Assistant Commissioners.
6 Tahsildars or Naib Tahsildars.

Medical.

5 Superior Officers.†
52 Hospital Assistants.
27 Compounders.
7 Dhais.
5 Nurses.
3 Sanitary Inspectors.

POLICE.

1 District Superintendent of Police on Special Duty.‡
4 Assistant Superintendents of Police.
4 Inspectors.
27 Deputy Inspectors.
272 Sergeants.
2,564 Constables.

10,273. There is a Sanitary Board in this Province, is there not?—Yes.

10,274. Does it do any work?—Yes: they meet at certain times.

10,275. Can you give us its composition?—No: I am not a member of the Sanitary Board.

10,276. Have you any Assistant Surgeons working under the Sanitary Commissioner in these provinces?—No.

10,277. Of what persons is the Inspecting Staff composed?—The Vaccination Staff is the only executive staff.

10,278. What native agency have you supervising the Vaccination Staff?—They are Divisional Supervisors of Vaccination.

10,279. They are not Assistant Surgeons?—No.

10,280. How are deaths reported here in the villages?—They are reported by the chaukidar, who is the watchman of the village, at the nearest Thana (police station). He has to take his book up once a week and report to the Babu (clerk) the deaths and births, and these are entered by the Babu, and the registers, one of which goes back to the chaukidar, who takes it back with him to the village. The collected reports made at the various thanas are sent up to the Civil Surgeon weekly, who embodies them in his weekly report, and sends them to the Sanitary Commissioner.

10,281. The Civil Surgeon is primarily responsible for looking into abnormal mortality—Yes.

10,282. Is the Sanitary Commissioner also responsible?—No.

10,283. Supposing that you had Assistant Surgeons employed in the Sanitary Department, would it help you in the matter of ascertaining outbreaks of disease?—Very much so, and it would certainly help in making our statistics of the causes of death much more accurate. At the present moment the man who decides what disease a man has died from is the village chaukidar, who has no medical knowledge of any kind whatsoever.

10,284. The Civil Surgeon is Health Officer of the District in the Province, is he not?—Yes.

10,285. Has he any Assistant Surgeon under him?—Yes, usually.

10,286. But the Assistant Surgeon is not able to do much touring about in the villages, I suppose?—No.

10,287. Who is responsible in the Municipalities for the registration of deaths?—It is done at the Thana in the same way as described above.

10,288. Do you think it is accurate in the Municipalities?—No.

10,289. Is it better than it is in the rural areas?—I should not think it was.

10,290. You generally have a dispensary in the Municipality?—Yes.

10,291. Could you utilize the officer in charge of the dispensary for checking the returns for mortality?—Yes; he could be used, certainly.

10,292. Would it be possible in that way to make the returns fairly accurate?—It certainly would be an improvement.

10,293. (*Mr. Cumine.*) Do you put in the maps* and charts† that you give at the beginning of your Report?—Yes, I will put them in.

10,294. Putting aside the members of the disinfecting gangs who got infected, not because they surreptitiously visited the village site in spite of the authorities, but because the authorities deliberately took them into the village site, have you noticed that there is any relation between the size of a village and the success of evacuation? That the smaller the village is, the more successful evacuation is in stopping plague within the maximum incubation period of 10 days?—No, I have not noticed that. Of course one could get a small village out in a day, but a big village will probably take four or five days.

10,295. Further, it is easier, is it not, in the case of a small village site than in the case of a big one, to prevent the people secretly visiting their evacuated houses?—Yes; one would naturally suppose that it would be easier, but I have not worked out the actual figures.

10,296. Can you tell us the limit of population of a village beyond which it is impossible to make evacuation effective?—No, because I do not think it depends upon the population but on the nature of the town. You could turn out 10,000 people if it were only for the people; it is their occupation and work which make it difficult.

10,297. By effective evacuation I meant evacuation that not merely gets all the people out but stops the disease in 10 days.—That depends upon the huts which you have ready, and all the other arrangements. It must vary in different places with different people. If you

* By May 7th there were five.

† By May 9th there were three more.

[NOTE.—These figures include Commissioned Medical Officers, one Officer of the Uncovenanted Medical Service, one Military Assistant Surgeon, and one Private Practitioner.]

‡ Later on a Second District Superintendent of Police was on Special Duty for a short period.

* *See* Appendices Nos. XXXIII. (1) to (6) in this Volume.

† *See* Appendix No. XXXV. in this Volume.

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have a well-trained staff who have done all the work before, they could do it in half the time a new staff would take.

10,298. Supposing you have got everybody out, is the disease more likely to stop within 10 days in a small village than in a large one?—Of course it would be easier in a small village than in a big one. I make the limit 20 days.

10,299. Taking the extreme period of incubation to be 10 days, one must expect to have cases going on within the first 10 days after evacuation; if cases do occur within the first 10 days after evacuation, that would not show that evacuation has been unsuccessful in stopping the disease. But I see from your tables that while in some cases the disease stopped within 10 days, in others it went on for 20, 30, or 60 days. Have you observed, then, whether there was any relation between the rapidity with which evacuation stopped the outbreak and the size of the village?—I cannot answer you definitely, because other things come in. If you are going to allow all the people to take out their goods you must disinfect them, otherwise they would take out their focus of infection with them.

10,300. (*The President.*) Do you think that having effected evacuation, success is more likely to be attained in the case of a small village than in a large one?—Yes.

10,301. (*Mr. Cumine.*) I think you have noticed a case of a village going out voluntarily?—Yes, at Chak Bilga.

10,302. And I think you have noticed a case of villagers establishing a sort of Plague Committee of their own?—Yes. That is in Dr. Wilkinson's report.

10,303. With the object of trying to prevent the plague attacking their villages?—Yes.

10,304. It is stated, I think, that they visited and inspected houses and made the chaukidars responsible for reporting to them every case of sickness in their respective pattis?—Yes. That was due, I think, to one particular man. They had a very good man in the village who did excellent service.

10,305. In that connexion can you tell me whether there are any measures, the utility of which has been so clearly demonstrated to the people, that they would themselves adopt these measures if plague attacked their villages again? For instance, would the villages which have been infected in the past season probably be on the alert to keep suspicious strangers out in the next season if there is plague about?—I think so.

10,306. With regard to evacuation, do you think its success has been so demonstrated to the people that they will of their own accord evacuate a village again in the event of a future case of plague occurring in it?—No; they will not do it of their own accord, but they will do it very willingly directly they are asked to do it. I think in most cases the villagers will not act in concert with each other; they want somebody to direct them. The people were very impressed with phenyle; they like it very much indeed. They call it the "butter-milk medicine," and we often found them stealing it. They are very fond of having their houses whitewashed, because it improves the appearance of their houses; they appreciate both those things.

10,307. Do you think they are so impressed with the advantages of having their clothes disinfected with phenyle that they will cheerfully allow it to be done again if they have plague cases among them?—It depends upon what their clothes are. I think that the poorer people are always willing, but a man who has a lot of silk and valuable things of that kind would be rather chary about seeing them put into phenyle.

10,308. Do you think there ought to be portable steam disinfectors?—They would be very nice if one could get them, but, of course they are expensive, and they are difficult things to cart about in a rough country.

10,309. Do you think the people are so much impressed with the value of having their houses disinfected that they would cheerfully submit to having that done if another plague outbreak came?—I think it will vary in different villages, but on the whole they are impressed.

10,310. In a village which has already had experience of plague, if plague appears again in that village, what will be the motive for concealment amongst the people? What is the particular measure which they would dread?—I think the evacuation of their houses is the thing which is most likely to give trouble, and also being cordoned. They object to being cordoned very much. I think I ought to have mentioned that first.

10,311. What is the average distance from one another of the villages in the affected area? Some of them seem very close—within a few hundred yards?—Yes. Of course, others are miles away. Our second village was nine miles from our first village, Birampur.

10,312. I do not mean necessarily the infected villages, but the villages generally in that part of the country?—Yes, it is a thickly populated country.

10,313. The village sites are close together?—Many of them are very close together.

10,314. I suppose the value of a cordon is relative, according as plague has first appeared in the district, or whether there are 60 or 70 villages infected? It is much more valuable at first if you have only one village infected?—Yes.

10,315. You can also make it much more effective then?—Yes.

10,316. Its effectiveness decreases in proportion to the number of villages you have to cordon?—Certainly.

10,317. What did you do with the stores of cotton and grain in the villages?—We laid them out in the sun.

10,318. What did you do with the people who were too poor to be able to remain 20 or 25 days without earning wages?—They got relief from Government.

10,319. I notice a great many workers in leather were attacked; can you give any reason for that?—The Chamars are the servants of the village. They are not only workers in leather, but they do the menial work of the whole village, and they would therefore come in contact with plague cases in the village.

10,320. Is there any particular class which has the right to get dead men's clothes?—Yes.

10,321. Who are they?—The Acharj, low-caste Brahmans.

10,322. Did you find that in villages where plague had been going on undiscovered, a large number of these people had been attacked?—No.

10,323. Have you noticed any cases of whitewashers being infected?—Yes.

10,324. A house is whitewashed after it has been disinfected?—Yes.

10,325. Would that point to disinfection not having been effective?—Yes, I am afraid it does. That is why we go in for all these processes, so that in case one fails we have another to fall back upon.

10,326. There is one village, I think, in which no disinfection was done at all?—Yes, Heon.

10,327. Was there any recrudesence in that village?—No, but I ought to state that the people who were attacked, a Sausi (one of the criminal class) and his little child, were living in an outhouse quite apart from the village. That outhouse was burnt and we positively may have checked the disease. However, we turned all the people out and allowed them to do whitewashing and to make holes in the roofs, but we could not at the time spare disinfectants. It was doubtful whether the village was ever affected at all, and we did not think it was necessary.

10,328. With regard to infection from property, have you any instances you would like to give?—I can give you a list of the villages in which it is supposed to be due to clothes, but it is not a very important point from the point of view of spreading the disease, because it requires human agency to convey the clothes, and if you stop the man going, you stop also the clothes.

10,329. (*Prof. Wright.*) Have you noticed any difference in the incidence of plague with regard to children? Have you noticed that children are immune from plague?—Yes, they seem to be less liable, at any rate in hospital. We had 13 mothers nursing their children whilst they had plague in Khankhanan Hospital. The children were very close to their mothers, of course, as they were taking the breast, and yet only one child got plague, and that child got it the day after admission, so that the chances are that it got the infection somewhere else, and not directly from the

mother. We do not know that that is so, but it is the natural inference one gets from the fact that the other 12 children all remained immune.

10,330. I take it that the sucking child may be imbibing immunising substances from its mother, and may thus not be so likely to get plague. I refer, therefore, rather to children other than children at the breast. Have you noticed that such children are less liable to plague than grown up people?—I have gone into the question, and can give the following two tables. It is better to give actual figures than merely impressions:—

TABLE showing the PERCENTAGE of PERSONS ATTACKED and DIED of PLAGUE according to AGE in the JULLUNDUR DISTRICT during the YEAR 1897-98.

No. of Villages.	Particulars.	Up to 5 Years.		6-10 Years.		11-20 Years.		21-30 Years.		31-40 Years.		41-50 Years.		51-60 Years.		Above 60 Years.		Total.	
		Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
75	Total - - -	199	136	310	185	634	367	599	345	420	272	268	187	190	141	86	64	2,706	1,697
	Percentage of deaths to cases.	68·34		59·67		57·88		57·59		64·76		69·77		74·21		74·41		62·71	

STATEMENT showing the NAMES of VILLAGES in which CHILDREN under TWO YEARS suffered from PLAGUE in the JULLUNDUR DISTRICT, as well as the NUMBER of such CHILDREN in each.

Serial Number.	Names of Villages.	Number of Children under Two Years who suffered from Plague.	Remarks.
1	Khankhanan - -	1	
2	Shikohpur - -	1	
3	Sirhal Qazian -	2	
4	Gunachaur - -	3	
5	Sahlon - -	1	
6	Mahlgahla - -	1	
7	Balon - -	1	
8	Lodhipur - -	1	
9	Mahrampur - -	2	
10	Masani - -	1	
11	Chak Bilga - -	2	
12	Bhaura - -	1	
13	Tahirpur - -	1	
14	Lidhar Kalan - -	1	
15	Salh Khurd - -	1	
16	Heon - - -	1	
17	Chahlon - -	3	
18	Karnana - -	1	
19	Bisla - -	2	
20	Dhandhua - -	1	
21	Lehl - -	2	
22	Punian - -	1	
23	Kariha - -	6	
24	Rasulpur - -	1	
25	Bhangal - -	1	
	Total - -	39	

10,331. Have you noticed that old people are more immune than people of middle age?—No. But in the above table it appears to be so.

10,332. Have you noticed that towards the end of a plague epidemic in a village the mortality becomes less in proportion to the cases?—No. We did not notice that to any marked extent, but we did find that as the hot weather came on the mortality became less.

10,333. You mean that the mortality declined *pari passu* with the cases?—No, the cases became milder in type.

10,334. With regard to the cases of *pestis ambulans* which you refer to, did you find them occurring at the beginning or end of an epidemic?—We found them at the end. Of course, I do not know whether they occurred at the beginning.

10,335. Was there any one village in which you had only mild cases?—Yes.

10,336. Was there any village in which you had no fatal cases?—There is no village where we had no fatal cases, I think.

10,337. Were there any villages where there was a large proportion of mild cases of plague?—We only had one or two of these mild cases altogether in any single village. They were generally in a village where we only had a few cases, and those in the middle of the hot weather. We never had any large numbers of mild cases in any one village.

10,338. Did you notice these mild cases occur more in children than in others?—Yes, in boys.

10,339. How many cases are you speaking of?—Half a dozen or a dozen.

10,340. Had you any cases of pneumonic plague among your disinfecting staff?—I cannot remember that; at any rate, it was not marked.

10,341. Were precautions taken to examine the hands and feet of disinfectors to see that there were no abrasions upon them?—Yes.

10,342. Have you examined any corpses of people who have died of plague?—Yes.

10,343. Have you made any *post mortems*?—No, but we have cut out and examined the glands of a certain number of cases. Of course, I saw *post mortems* done in Bombay, but not in this particular epidemic we are now considering. We were among people who very much objected to *post mortem* examinations.

10,344. Have you noticed any œdema occurring on the chest and upper limbs of people who have died of plague?—Yes.

10,345. Is that symptom common?—I think it is fairly common in connexion with enlarged axillary and cervical glands. You mean the œdema which runs right down and across the chest. I have found this fairly frequent. I have not seen œdema of the chest irrespective of enlarged glands.

10,346. Do you think you would be able to diagnose a pneumonic case of plague by means of the œdema on the front of the chest?—We had a marked œdema in several cases, but I found the gland afterwards just at the episternal notch. I think we found four cases like that.

10,347. Did you notice any œdema of the chest wher you had exclusively inguinal buboes?—No.

10,348. Will you give us the history of the plague in the village of Mahlgahla?—Yes. The following are the principal statistics relating to that village:—

Census population (1891) - - -	2,548
Roll-call - - -	2,488
Muhammadans - - -	192
Hindus, chiefly Jats - -	1,914
Chamars and Ramdasis - -	307
Sweepers - - -	75
Number of houses - - -	926
,, ,, infected -	60
,, plague cases returned -	101
,, deaths returned -	57
,, recoveries returned -	44

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Date of first case	- - -	22nd Feb. 1898
,, ,, returned	-	23rd ,,
,, declaration of plague	-	23rd ,,
,, cordoning of village	-	23rd ,,
,, evacuation of village	-	17th Mar. 1898
,, commencement of disinfection	- - -	23rd ,,
,, completion of disinfection		20th May 1898
,, last case	- -	3rd ,,
,, return to village	- -	4th June 1898
,, removal of cordon	- -	10th ,,
,, village declared free of plague	- - -	14th ,,

Mahlgahla is one of the most instructive villages with which we have had to deal. There seems little doubt that we obtained very early information about it, and although energetic measures were immediately taken, the inhabitants suffered severely. I have already described (*see* Question 10,196) how infection was brought into the village from Mallupota by Shiv Dai, the grand-daughter of Hamera, Lambardar. She fell ill on February 22nd. The following day, February 23rd, Uttam Singh, her father-in-law, and the whole of his family, including the patient, were put out into a suitable camp some distance from the village, and remained there till March 17th, when they went into a newly formed health camp. A few days after Shiv Dai's attack, Uttam Singh's house was thoroughly disinfected and whitewashed by a trained gang from Khankhanan, it being considered inadvisable to employ any of the Chamars belonging to the village itself. Between February 22nd and March 15th (21 days), no new cases occurred, and it seemed as if the disease had been nipped in the bud. Shiv Dai made a rapid and uneventful recovery and the whole family with all their personal property were washed in phenyle solution preparatory to allowing them to return to the village. On the latter date, however, our hopes were dashed to the ground. One of the Lambardars arrived late at night at our camp and reported that several of the Chamars and sweepers in the Chamars' quarters had been attacked, the first attacked being the kamin or servant of Uttam Singh. The following day, the evacuation of the whole village, of 2,488 persons, was commenced, the Chamars being given a separate camp from the others. A brisk epidemic broke out among the latter, 25 of whom were attacked, mostly from the segregation camp. The evacuation was completed on March 17th, and the disease stopped on the 24th, seven days later. Up to this time only Chamars had suffered, excluding the girl who introduced the disease. On March 23rd, the systematic disinfection of the village was commenced. The "infected" houses in the Chamars' and sweepers' quarters were first done, and it is important to note that none of the persons employed on the disinfection of these houses was attacked with plague. The work was completed on the 28th. The cleaning of the "healthy" houses was then commenced. On April 2nd, more cases began to occur among the disinfecting gang, and on the 4th, a Muhammadan bhisti from the "healthy camp" was attacked. At this time it was almost impossible to obtain coolie hire, as the crops were ripe, and it was of importance to the zamindars that their grain should be gathered with the utmost speed. They, therefore, employed every available workman in the village. We were consequently obliged to allow house-owners to do their own disinfecting and whitewashing under the supervision of a European Sanitary Inspector. Large numbers of rats were found dead all over the village, and people working at the disinfection were frequently attacked. The disease got into the large so-called "healthy camp," and although disinfection of all the clothes and personal property, and giving a phenyle bath to every person was started immediately, it was found that, on account of the large size of the camp, this took some time to accomplish. In fact, we did not wait for the work to finish, but broke up the large camp into four smaller ones. This was completed on April 23rd. On April 22nd, on account of the large number of casualties among the people on disinfection work, we suspended the work altogether. The day previously, Mr. Goulbourne, the European Sanitary Inspector, was attacked with plague. He died three days later. Nine persons were attacked on April 22nd, and 13 on the 23rd. There were then two or three cases daily till the 27th (five days after stopping the disinfection). The disease then stopped, with the exception of one dropping case on May 3rd. The patti where most people were attacked among the disinfectors was one which was at the extreme north-east corner of the village, while the Chamars' quarters, where the cases of plague had occurred before evacuation, was situated at the south-west corner. The infection had, therefore, travelled the whole breadth of this large village after all the people had left it. No dead rats were seen before evacuation; they were found all over the village after the place had been emptied, and in one room alone 15 dead rats were found. They could not have died of starvation, as a large quantity of grain was left in the village and was easily accessible. In May, we completed the disinfection with a properly constituted gang of coolies supervised by two well-trained Hospital Assistants. As we were not satisfied with the previous disinfecting, and also bearing in mind what a very strong focus of infection the village had been, we had the entire village redisinfected. No casualties occurred during the second disinfection, and no rats, dead or alive, were found. The people began to return to their homes on June 4th, having been two months and 18 days in camp. They had 101 cases of plague, with 57 deaths, being a percentage of 4·05 cases to population and 56·43 deaths to attacks.

The following is a table of the "daily state," from the beginning to the end of the epidemic in Mahlgahla:—

February.							March.																										
Date -	23	24	25	26	27	28		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Cases -	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	2	6	1	2	1	1	2	1	2	-	-	-	-	-
	Imported case.																			Chamars attacked.			Total village evacuated.					Disinfection of infected houses.							

March.			April.																													May.		
Date -	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3
Cases -	-	-	-	2	2	4	8	1	1	2	1	3	-	-	3	-	2	1	-	-	3	6	6	9	13	2	3	2	1	-	-	-	-	-	1
	Disinfection of Chamars' and sweepers' quarters completed.		Uttam Sing's Patti disinfected.								Jaimal Singh's Patti disinfected.				Sundar Singh's, Nihal's and Gurditta's Pattis disinfected.								Disinfection entirely suspended.											Last case.		

10,349. Would you have any objection to treating plague in a village by disinfecting block after block and allowing each set of people to return to their block of houses? Would you consider that a reasonable alternative to the evacuation of a whole village?—No, I think evacuation is much better. It is so much better that I would prefer total evacuation. In Banga we allowed the Rawals to go back while we disinfected

the rest of the village, but I think it was a dangerous experiment.

10,350. You think the block might be re-infected?—Yes. Of course, in large towns it is different; one must be prepared for less severe measures.

10,351. You said when you made the openings in the houses, these were closed up again as soon as the people returned?—Yes.

10,352. Did that apply to the roofs, or to the southern windows which you made in the houses?—It applied to most of the openings we made.

10,353. If you want advice on matters of bacteriology, is there any bacteriologist in the Punjab to whom you can send your specimens?—I have examined specimens myself, but we have no bacteriological laboratory.

10,354. Have you any convenience for making bacteriological examinations yourselves?—No.

10,355. Have you any means of procuring culture media?—Yes. I can get culture media both from a firm in Bombay and from Mr. Hankin.

10,356. (*Dr. Ruffer.*) You can get agar, but can you get bouillon?—No.

10,357. (*Prof. Wright.*) I suppose you are put to serious inconvenience in bacteriological work by these defects?—Yes.

10,358. (*The President.*) There is a Medical School here, I think?—Yes.

10,359. Is there no laboratory in which bacteriological observations can be carried on?—I do not think it is on a large scale.

10,360. They have laboratories?—Yes, but I do not know on what scale.

10,361. I gather that your view is that the most satisfactory measure with which to combat plague is evacuation?—Yes. It is fairly well established that in evacuation of villages we have a method of quickly and certainly stamping out plague. In not a single village in the areas under consideration could it be said to have failed. It was successful in every season of the year, though it took longer in the winter than in the summer. It was equally successful in large villages from 3,000 to 4,000 people as in little hamlets.

10,362. But you would not trust to this alone without other measures?—No.

10,363. To what other measures do you particularly allude?—Disinfection of the village site and disinfection of the people.

10,364. Have you any instances of supposed infection of clothes in which you can absolutely exclude infection from other sources?—No; I do not think I could say definitely.

10,365. With regard to this mild plague, *pestis minor*, what are its distinguishing features?—As I understand it, it is a disease in which there are buboes with fever without the patient being very ill, and without his ever becoming delirious or unconscious.

10,366. You have seen some cases I understand?—Yes.

10,367. Were these patients able to go about?—Yes.

10,368. During the whole time they were affected?—That I will not say, but, at any rate, the time they were laid up was so small that they were practically able to go about the whole time.

10,369. Did it come under your observation that any of these cases originated from an ordinary case of plague?—Yes, I think the boy at Gobindpur was infected from an ordinary case of plague.

10,370. What is the general type of dwellings in the villages where plague has occurred?—They are made of unbaked bricks, mud-houses, usually square or rectangular with flat roofs. They are very simple houses, many of them not containing windows, and the only means of ventilation and light is the doorway.

10,371. Is there one uniform type?—Oh, no, there are various kinds of houses, but that is the average type.

10,372. Are there any houses distinctly superior to this type in these villages?—Yes; in Banga town we had almost every form of house, and some were very good houses indeed.

10,373. In which of these types of houses did plague seem to be most prevalent?—There was one good house where there was a case of plague, but the cases were most prevalent in the mud-houses.

10,374. Your experience coincides with that of everyone else, that plague cases treated in camp, or even in hospitals, do not communicate the plague to others to any important extent?—That is so.

10,375. Whereas, of course, it would do so in the houses?—Yes.

10,376. To what do you attribute that?—Probably to the want of accommodation and the want of ventilation. Whatever the medium is by which infection passes from one patient to another, it seems as if it is more active in these small houses.

10,377. How would you state the leading distinctions between the conditions of dwelling in plague camps or hospitals, and the conditions of dwelling in the villages where plague raged?—Light and air seem to be inimical to the spread of plague, while dark and badly ventilated places are conducive to it.

10,378. (*Dr. Ruffer.*) Supposing you were sure that disinfection had been carried out properly, how long after a case of plague would you keep the people out of their houses? Would ten days be sufficient in a case like that?—Yes.

10,379. With regard to œdema of the front of the thorax and abdomen, have you encountered that often in people who have died from plague?—I was referring to the œdema which accompanies the buboes in the axilla.

10,380. Have you seen any œdema that starts near the base of the neck and extends downwards?—I can only remember four cases, and in each of these cases I was able to find an enlarged bubo on the neck. I have not seen it independent of buboes, or, at any rate, I have not noticed it.

10,381. In these cases, did it extend down to the abdomen or only to the upper part of the thorax?—Only to the upper part of the thorax.

10,382. You have seen none on the anterior aspect?—No.

10,383. I suppose it would have been impossible for it to have escaped your attention if such an œdema did exist?—I think so, in the cases which I have seen. But possibly it may have existed in a great many cases which I did not see.

10,384. (*Mr. Hewett.*) Can you explain the occurrence of cases more than 20 days after evacuation in the following villages:—Khatkar Kalan, Jhander Khurd, Khankhanan, Shikohpur, Sirhal Qazian, Maliupota, Sahlon, Mahlgahla, Kumam, Karnana, Balon, Nurpur, Lodhipur, Mahrampur, Banga, Katt, Haphowal, Chak Bilga, Bahrwal, Langeri, Chahlon, Bisla, Karina, Pharala?—These cases are noticed in the following statement:—

Village.	No. of Cases.	Remarks.
1. Khatkar Kalan -	3	Attacked 20 days after evacuation. One man was attacked while on disinfection work. I do not know the source of infection in the other two cases.
2. Jhandher Khurd -	2	Source of infection unknown.
3. Khankhanan -	15	These cases were due to a re-infection from the village during disinfection of the Tarkhans' quarter.
4. Shikohpur -	2	One of these, a Chamar, was a member of the disinfecting gang.
5. Sirhal Qazian -	26	This large village was evacuated during the winter rains. The people huddled together in their huts, and plague corpses were found in some of the camps. I attribute the slow success attending evacuation in this village to the unsatisfactory condition of the weather making camp life and supervision difficult.

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Village.	No. of Cases.	Remarks.
6. Mallupota -	7	All sweepers; some men in the disinfecting gang got infected and seem to have carried the infection to their camp, which had previously been free. The disease stopped on disinfecting the camp and moving its site. The sweepers working in the gang did not resume work till they had all been inoculated with Haffkine's prophylactic. No more were attacked.
7. Sahlon - -	3	No notes in the register. But as two were sweepers and one a waterman, it is probable that they were in the disinfecting gang.
8. Mahlgahla -	59	I have already described this village in detail. The people were allowed to do their own disinfecting, and were attached after going into the village for this purpose. The disease ad previously died out in the camps.
9. Kumam - -	22	This was one of Dr. Walton's villages. Notes not procurable.
10. Karnana - -	1	One case was discovered in this village on 28th February for which only one house was evacuated. The village was declared free on March 29th. But further cases obviously contracted from the former case were found on April 6th, 1899. The hospital register does not state the cause of the last on May 2nd.
11. Balon - -	4	Two of these belonged to the disinfecting gang. (Hospital Register).
12. Nurpur - -	3	Cause unknown.
13. Lodhipur -	3	Cause unknown.
14. Mahrampur -	9	Cause unknown. Two were Chamars, and two Julahas (weavers), and five Jats.
15. Banga - -	1	The man had been ill some time before he was discovered. The case really occurred within the 20 days after evacuation.
16. Katt - -	3	Cause of infection unknown.
17. Haphowal -	8	Due to two persons who went surreptitiously to the village at night, and subsequently spread the disease in their families
18. Chak Bilga -	3	Cause of infection unknown.
19. Bahrwal - -	3	Register not obtained.
20. Langeri - -	2	The village site was not cordoned and these people might have gone into the village. There was no other evidence.
21. Chahlan - -	1	Cause not stated in register.
22. Bisla - -	4	Two of these were members of the disinfecting gang.
23. Kariha - -	2	Both people who returned to get property out of the village.
24. Pharala - -	5	The disease broke out again in a house, previously believed to be free, and where the disinfection had been hurriedly carried out, after the return of the people to the village.

(Witness withdrew.)

(Adjourned till to-morrow.)

At Government House, Lahore.

THIRTIETH DAY.

Friday, 20th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

MR. J. P. HEWETT.
Prof. A. E. WRIGHT, M.D.
Mr. A. CUMINE.
Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Capt. E. Wilkinson, I.M.S.

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Captain E. WILKINSON, I.M.S., called and examined.

10,385. (*The President.*) You are the Deputy Sanitary Commissioner of the Punjab?—Yes.

10,386. And you are also Plague Medical Officer of Banga?—Yes.

10,387. You are prepared to give us information with regard to the outbreak of plague in a number of villages?—Yes, about 22 or 23.

10,388. Will you kindly name the villages?—Gunachaur, Jagatpur, Masani, Tahirpur, Mazara Nauabad, Sotran, Lidhar Kalan, Khanpur, Bika, Sirhal Mandi, Mokandpur, Lehl, Chak Kalal, Punian, Rehpa, Gosal, Anjla, Chhokran, Turan, Aur, Kariam, and the Municipal town of Rahon.

10,389. With regard to each village you have prepared a statement of statistics, giving the total population, the average death rate from all causes before plague occurred, and other facts?—I have done so with regard to Sotran, Lidhar Kalan, Khanpur, Bika, Punian, Gosal, and Kariam.

10,390. Will you put these tables in?—Yes. They are as follows:—

SOTRAN.

1. The total population immediately before the outbreak of plague, 313.

2. The average death rate from all causes in years when there has been no plague:—

1895.	1896.	1897.
12	13	12

3. The average weekly population for each week during the period in which plague was epidemic. First case of plague, March 18th; evacuated, March 24th.

Week ending:—

30th March 1898.	6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.
313	310	307	305	303	302	302	302	302

4. The total mortality from all causes, week by week, during the period of plague. Last case, April 30th.

Week ending:—

30th March 1898.	6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1998.	1st June 1898.
6	1	2	1	2	1	0	0	0	0

5. The total mortality from plague alone, week by week, during the period of plague.

Week ending:—

30th March 1898.	6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.
7	1	1	1	1	1

6. The total number of contacts segregated and the average period of their detention:—

Total Number of Segregated.	The Average Period of their Detention.
35	6 weeks.

7. The average population of contact camps, week by week, as long as they were maintained.

Week ending:—

30th March 1898.	6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.
17	21	24	27	34	35	35	35	35

8. The total weekly mortality from all causes in contact camps.

Week ending:—

30th March 1898.	6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.
0	0	1	0	0	0	0	0	0

9. The total mortality from plague, week by week in contact camps.

Week ending:—

30th March 1898.	6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.
0	0	1	0	0	0	0	0	0

LIDHAR KALAN.

1. The total population immediately before the outbreak of plague, 664.

2. The average death rate from all causes in years when there has been no plague:—

1895.	1896.	1897.
Not known.		

3. The average weekly population for each week during the period in which plague was epidemic. First case of plague, March 25th; evacuated, March 29th.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
664	667	652	651	651	651

4. The total mortality from all causes, week by week, during the period of plague.

Week ending:—

6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.
6	4	4	0	2	1	3	0	0

5. The total mortality from plague alone, week by week, during the period of plague. Last case, April 28th.

Week ending:—

6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.
6	3	3	1	1

6. The total number of "contacts" segregated, and the average period of their detention:—

Total Number of Segregated.	The Average Period of their Detention.
63	3 weeks.

7. The average population of contact camps, week by week, as long as they were maintained.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
42	47	55	61	62	63

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8. The total weekly mortality from all causes in contact camps.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
4	3	1	0	0	0

9. The total mortality from plague, week by week, in contact camps.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
4	3	1	0	0	0

KHANPUR.

1. The total population immediately before the outbreak of the plague, 632.

2. The average death rate from all causes in years when there has been no plague:—

1895.	1896.	1897.
26	12	15

3. The average weekly population for each week during the period in which plague was epidemic. First case, March 27th.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
632	619	619	618	618	618

4. The total mortality from all causes, week by week, during the period of plague.

Week ending:—

6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.
8	7	0	2	1	0	0	0	0

5. The total mortality from plague alone, week by week, during the period of plague. Last case, April 26th.

Week ending:—

6th April 1898.	13th April 1898.	20th April 1898.	27th April 1898.
8	6	0	1

6. The total number of contacts segregated, and the average period of their detention:—

Total Number of Segregated.	The Average Period of their Detention.
55	3 weeks.

7. The average population of contact camps, week by week, as long as they were maintained.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
34	36	55	55	55	55

8. The total weekly mortality from all causes in contact camps.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
5	0	0	0	0	0

9. The total mortality from plague, week by week, in contact camps.

Week ending:—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.
5	0	0	0	0	0

BIKA.

1. The total population immediately before the outbreak of plague, 349.

2. The average death rate from all causes in years when there has been no plague:—

1895.	1896.	1897.
8	11	4

3. The average weekly population for each week during the period in which plague was epidemic. First case, April 9th.

Week ending:—

20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
349	334	333	332	332	332	332	332

4. The total mortality from all causes, week by week, during the period of plague. Last case, May 1st.

Week ending:—

20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.	15th June 1898.	22nd June 1898.
8	2	2	0	0	0	0	0	0	0

5. The total mortality from plague alone, week by week, during the period of plague.

Week ending:—

20th April 1898.	27th April 1898.	4th May 1898.
7	1	2

6. The total number of contacts segregated, and the average period of their detention :—

Total Number of Segregated.	The Average Period of their Detention.
43	4 weeks.

7. The average population of contact camps, week by week, as long as they were maintained.

Week ending :—

20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
17	22	27	28	39	39	41	43

8. The total weekly mortality from all causes in contact camps :—

Nil.

9. The total mortality from plague, week by week, in contact camps.

Week ending :—

13th April 1898.	20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
0	0	0	0	0	0	0	0	0

PUNIAN.

1. The total population immediately before the outbreak of plague, 422.

2. The average death rate from all causes in years when there has been no plague :—

1895.	1896.	1897.
23	20	9

3. The average weekly population for each week during the period in which plague was epidemic. First case, April 14th ; evacuated, April 24th.

Week ending :—

4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
422	417	417	417	417	417

4. The total mortality from all causes, week by week, during the period of plague.

Week ending :—

27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.	15th June 1898.	22nd June 1898.
15	9	0	0	0	0	1	0	0

5. The total mortality from plague alone, week by week, during the period of plague.

Week ending :—

27th April 1898.	4th May 1898.	11th May 1898.
15	7	2

6. The total number of contacts segregated, and the average period of their detention :—

Total Number of Segregated.	The Average Period of their Detention.
115	25 days.

7. The average population of contact camps, week by week, as long as they were maintained.

Week ending :—

27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
—	89	93	104	113	113	115

8. The total weekly mortality from all causes in contact camps :—

Nil.

9. The total mortality from plague, week by week, in contact camps.

Week ending :—

20th April 1898.	27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
0	0	0	0	0	0	0	0

GOSAL.

1. The total population immediately before the outbreak of plague, 460.

2. The average death rate from all causes in years when there has been no plague :—

1895.	1896.	1897.
15	12	8

3. The average weekly population for each week during the period in which plague was epidemic. First case, April 21st ; evacuated, April 22nd.

Week ending :—

4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
460	456	456	456	456	456

4. The total mortality from all causes, week by week, during the period of plague. Last case, May 5th.

Week ending :—

27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.	15th June 1898.
4	4	3	1	1	0	0	0

5. The total mortality from plague alone, week by week, during the period of plague.

Week ending :—

27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.
3	1	3	0	1

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6. The total number of contacts segregated, and the average period of their detention :—

Total Number of Segregated.	The Average Period of their Detention.
55	3 weeks.

7. The average population of contact camps, week by week, as long as they were maintained.

Week ending :—

4th May 1898.	11th May 1898.	18th May 1198.	25th May 1898.	1st June 1898.	8th June 1898.
—	—	—	55	48	48

8. The total weekly mortality from all causes in contact camps.

Week ending :—

27th April 1898.	4th May 1898.	11th May 1898.	18th May 1898.	25th May 1898.	1st June 1898.	8th June 1898.
0	0	1	0	0	0	0

9. The total mortality from plague, week by week, in contact camps :—

Nil.

KARIAM.

1. The total population immediately before the outbreak of plague, 1,723.

2. The average death rate from all causes in years when there has been no plague :—

1895.	1896.	1897.
63	55	51

3. The average weekly population for each week during the period in which plague was epidemic.

Week ending :—

8th Oct. 1898.	15th Oct. 1898.	22nd Oct. 1898.	29th Oct. 1898.	5th Nov. 1868.	12th Nov. 1898.	19th Nov. 1898.	26th Nov. 1898.	3rd Dec. 1898.	8th Dec. 1898.
1,723	1,745	1,751	1.754	1,755	1,759	1,763	1,769	1,742	1,719

4. The total mortality from all causes, week by week, during the period of plague.

Week ending :—

8th Oct. 1898.	15th Oct. 1898.	22nd Oct. 1898.	29th Oct. 1898.	5th Nov. 1898.	12th Nov. 1898.	19th Nov. 1898.	26th Nov. 1898.	3rd Dec. 1898.	8th Dec. 1898.
2	3	0	2	1	0	2	0	2	0

5. The total mortality from plague alone, week by week, during the period of plague :—

Nil.

6. The total number of contacts segregated, and the average period of their detention :—

Total Number of Segregated.	The Average Period of their Detention.
46	6 weeks.

7. The average population of contact camps, week by week, as long as they were maintained.

Week ending :—

8th Oct. 1898.	15th Oct. 1898.	22nd Oct. 1898.	29th Oct. 1898.	5th Nov. 1898.	12th Nov. 1898.	19th Nov. 1898.	26th Nov. 1898.
20	30	31	31	46	40	30	31

8. The total weekly mortality from all causes in contact camps :—

Nil.

9. The total mortality from plague, week by week, in contact camps :—

Nil.

10,391. How far do the facts you have observed support the idea of human conveyance of plague?—I think they support it strongly, inasmuch as, in a large number of the villages, the first people to be attacked were people who were known to have gone to infected villages, and there is no other known source of infection in that village. Each separate village was a source of very careful inquiry, and so far as was possible, every other source of infection was eliminated, and the people who were shown as having been attacked were known to have gone to infected villages, and in many cases to infected houses in other villages. It is not always possible to show that a man did go to an infected house, but in many cases it is possible to show that he went next door to an infected house, and in other cases that he did go to an infected house.

10,392. You have carefully examined all the facts?—Most carefully.

10,393. In which villages did you find that the source of infection had been human agency?—In Gunachaur, Jagatpur, Masani, Tahirpur, Mazara Nauabad, Lidhar Kalan, Khanpur, and Bika. In Sirhal Mandi there was probably human agency; in Mokandpur there certainly was, and in Lehl probably. I will speak of the village of Chak Kalal presently. In Punian, Gosal, Chhrokan, Turan, Aur, Kariam, and Rahon infection was certainly carried by human agency. In all those villages it was human agency that carried infection, and with the exception of Rahon, Kariam, Sotran, Raipur, and Aur, I think the agency was direct, that is to say, the infection was brought by a patient having contracted the disease in another village.

10,394. Have you any facts which seem to show that clothes, or articles apart from human bodies, have conveyed infection?—In the case of Kariam there was at the time no existing case of plague there, from which the person who was first attacked in Kariam could have got it. The first case of plague occurred in Kariam in a man who had not left the village for at least six weeks previously. The villages close to Kariam had been infected some three months previously by plague, but not since. This man admits having gone to these infected villages during the hot weather, but, as I said, he had not left the village for six weeks before he was attacked. He made a statement that he did get clothes from these villages, and the clothes are the only thing I could find to account for that infection. It cannot be direct human agency.

10,395. You do not know if any clothes or other articles came from an infected area?—No.

10,396. It is only a supposition?—Yes.

10,397. Have you any other case?—The case of Sotran. In Sotran there is a direct history of clothes, and there is no possible history of direct infection, and it is noticeable that within a few days after having received

clothes from an infected village the woman first attacked became ill.

10,398. Have you any other case?—There is the case of Rehpa, which is more definite. The first person to be attacked at Rehpa was Chandi, wife of Variam Singh, who was taken ill on April 16th, and died the next day; she had buboes on both sides of the neck. It is said that Gulab Singh, a tailor of Jagatpur, had brought clothes to this house on April 14th. A member of his family, name not ascertained, is said to have died of plague, and it is stated that he made these clothes in a segregation camp at Jagatpur. An inhabitant of Jagatpur stated independently that Gulab Singh had taken clothes to the house of the person first attacked at Rehpa, but whose name he did not know.

10,399. Have you any information about the conveyance of plague by rats?—There is one village, Hamirowal, in which it is positive that the infection must have been carried by rats.

10,400. On what grounds?—The village of Hamirowal consists of Muhammadans, and near it there is a village of Sikhs, who have no communication with each other whatever. The outlying houses are only separated by, perhaps, 100 yards, or less. There was nobody in Hamirowal attacked with the plague at all; but when the people left their houses, rats were seen to die in one of the houses.

10,401. Why did the people leave their houses?—Because, being near Punian, it was thought the infection might be carried to them. It was a precautionary measure. We treated that as an infected village, and in the small village of 30 houses we found 28 dead rats.

10,402. And then these people moved to camp, I understand?—The people moved into camp *before* we found the rats. Two rats died in the village the day the people moved into camp.

10,403. What occurred there?—Nobody was attacked with plague in the camp.

10,404. Was there any distinct evidence of carriage by rats?—Only that the rats died of supposed plague.

10,405. That was an instance of rats being infected by plague. But what I want to get is an instance in which rats conveyed plague to human beings?—There is no positive proof. There is the village of Chak Kalal. I think Captain James has already referred to that.

10,406. You have no positive evidence?—I have no positive evidence.

10,407. Have you been able to come to any conclusion as to the duration of the incubation stage from these or any other cases?—There are many cases which have been attacked very shortly after exposure to infection, and in my précis of evidence I have stated the interval between persons having visited an infected village and their being attacked. That, of course, limits the period as far as the shortness of it is concerned, but it does not show how much longer it may have been, because they may have got their infection some days before they left the infected village.

10,408. Between what intervals do you estimate the incubation period to vary?—I do not know of any period more than ten days.

10,409. I think you stated in your précis 10 or 12 days?—Twelve days is in the case of Chhokran. I gave the extreme limit because one is never quite certain when one sees a patient how long he has been ill and how far his statement may be true. Therefore I have given the absolute limit there as 12 days.

10,410. Judging from the data which you possess, within what number of days would you put the limit of the incubation period?—I should be inclined to think that in most cases the incubation period is within five days, but I should think it was possible to go on to ten days.

10,411. Five is the most frequent?—I should think so.

10,412. What is the shortest period?—Less than a day.

10,413. How do you think the plague virus enters the individual?—I have no definite information about that.

10,414. You have seen a large number of cases of plague?—Yes.

10,415. In what form have you generally seen it?—In the bubonic form.

10,416. Have you seen any pneumonic cases?—Not in the Punjab. I have seen four in Bombay.

10,417. Have you made any *post mortem* examinations?—Yes, in Bombay. The *post mortem* examinations I made at Bombay were of cases of the bubonic and not of the pneumonic form.

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10,418. Can you give us an account of the *post mortem* appearances?—In the cases I examined there was usually the bubo, which was the most positive feature. The bodies were always examined a few hours after death, it being a warm climate. The blood was fluid and dark. The bubo was generally the first thing we noticed, and that consisted of a mass of glands. The glands themselves were intensely swollen, and the surrounding tissues were also swollen and matted together to the gland so that it was difficult when one cut into it to be quite sure which was gland and which was the surrounding tissue.

10,419. Now with regard to the organs?—A noticeable feature in the stomach was the petechiæ. The whole surface of the stomach, the mucous membrane, was rather congested, but there were very noticeable petechiæ towards the pyloric end. I rather forget about the duodenum. We used frequently to find, in cases where there was no external bubo, that the lymphatic glands along the spine were enlarged and also the mesenteric glands, although there was no inflammation in them, as there was in the glands affected by bubo. Yet they were distinctly enlarged, and softer than one would expect.

10,420. The tissues immediately surrounding were not so much affected?—The tissues around were not affected at all, and the inflammation in them was very slight. In speaking about the bubo I forgot to state that there was always an œdema around it, in some cases very considerable, extending along the lines of the vessels. If in the axilla, the œdema extended down the side of the chest. On no occasion did I examine the brain; I had no instruments.

10,421. With regard to the liver?—The liver was somewhat large and congested, and the spleen enlarged and congested. The kidneys also were enlarged, and there were sometimes petechiæ on the capsule.

10,422. Do you know if albuminuria is often present in cases of plague?—I cannot say often, but in several cases which I examined I found it. I did not examine very many cases, but I can remember finding it in three or four cases which I did examine.

10,423. During life?—Yes.

10,424. Did you notice any œdema in the subcutaneous tissues at the front of the body?—No.

10,425. Is it likely to have been present without attracting your attention?—I am certain it could not have been.

10,426. In the *post mortem* examinations you would necessarily make an incision in the mesial line?—Yes.

10,427. Œdema in this situation would probably not have escaped your attention?—Quite impossible, I should think.

10,428. You never saw any?—No. In two cases in Rahon during life there was no bubo at all. One case was that of a little girl who was attacked late one evening and died early the next morning. Her symptoms were more connected with the bowels, that is to say, she had vomiting and diarrhœa, and I was very doubtful, but I could not find anything to suggest plague. There was absolutely no bubo or anything to be felt, but the right axilla was just a little more full. It was not actually œdematous, but it felt just a little more full. I found the bubo very deep in the axilla. In another case the only external sign was œdema extending down the right side of the chest; I could not find the bubo while she lived, and I did not get an opportunity of examining her after death.

10,429. In two cases there was a certain amount of œdema?—Yes, limited to the side of the chest.

10,430. Did you examine any pneumonic patients?—Yes, in Bombay.

10,431. Do you recollect the condition of the lungs?—They were very acutely inflamed; they were not solid as they were in ordinary pneumonia; there was nothing of that hard friable tissue which you find in ordinary pneumonia, but the whole lung was enlarged and intensely inflamed. The pneumonia was of the lobular type distributed throughout the whole of the lungs.

10,432. Do you remember if the lung sank in water?—I cannot remember that.

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10,433. What parts of the lungs were generally affected?—The whole lung on both sides.

10,434. Double pneumonia?—Yes.

10,435. And of each lobe?—I think so.

10,436. Did you make any bacteriological examination in any of these cases?—Yes.

10,437. With what result?—I never examined the lungs at the *post mortem*, but I examined the sputum, and in fact in all those I found the plague bacillus.

10,438. After death?—No, during life.

10,439. Can you remember at what interval before death in any cases?—It must have been in all cases at the utmost three days. I cannot remember exactly now how long, but the longest period these people lived was from one to three days.

10,440. Three days is the longest interval?—Yes.

10,441. That refers only to pneumonic cases?—Yes.

10,442. Did you make any bacteriological examination in the bubonic cases?—Yes.

10,443. With what result?—I never found the bacillus in the sputum.

10,444. Where did you look for it?—In the sputum. I found the bacillus in the blood.

10,445. Do you remember what time before death?—Almost invariably within 24 hours.

10,446. Have you ever found it at a longer period than 24 hours before death?—No.

10,447. Did you examine anything else in connection with plague cases—the urine or fæces?—No.

10,448. Only the blood and sputum?—Yes.

10,449. You were in charge of the measures which were taken to check the plague in the different villages which you have referred to?—Yes.

10,450. Will you state the measures briefly?—The measures were the segregation of patients and their friends, and the evacuation of the whole village, and then the disinfection of the whole village.

10,451. In what instances did you adopt total evacuation of a village?—When more than one case occurred in a village the whole was evacuated.

10,452. And when only one case occurred?—When only one case occurred only the patient and his friends and a few surrounding houses were evacuated.

10,453. Why did you evacuate the surrounding houses?—On account of the possibility that the infection might have spread.

10,454. Is it within your knowledge that the infection seems to spread by proximity?—Most distinctly so. Will you look at the map of Lidhar Kalan.* If you look at house No. 2 on the map you will see it is approached from the eastern side of the village. House No. 3 is approached from the south side, and there is no communication at all between the two houses. The people who live in No. 2 house are Chamars, and the people who live in house No. 3 are Sikh carpenters. They are people who would not have anything to do with each other at all. In both of those houses ten days before the people were attacked, rats were found to have died. A dead rat was found in house No. 3 on March 19, ten days before the villagers went into camp, and another was found a few days later. The back of house No. 3 adjoins No. 2, but, as will be seen by a reference to the map, the houses are approached from different sides of the village.

10,455. The extension to the immediate vicinity you explain by infection from rats?—It looked like rats, inasmuch as in both houses dead rats were found before the people were attacked.

10,456. It is then in conformity with your experience that plague spreads very much by proximity, and you think that the explanation of this is carriage by rats?—Yes. In the case of Lidhar Kalan the houses could not be got at by going along the same road. Will you look at the map of Bika?* Reference to the map will show that in order to get to house No. 2, people would pass near house No. 4; but the entrances of the houses are at a considerable interval, and yet these houses beginning at Nos. 2, 3, 4, and 5, were all attacked in succession, and in all of them rats were found when we disinfected them.

10,457. And it is not probable that there was any human communication between the inmates?—There is a possibility of human communication, because they were all of the same caste; they would have naturally communicated with each other if they had wanted to. But in the case of Lidhar Kalan they would not have communicated.

10,458. It is upon those grounds that you adopted evacuation?—Yes.

10,459. What is the largest town you have evacuated?—The town of Rahon, which has a census population of over 10,000; but the actual population we found to be 8,900.

10,460. How long did you take to evacuate that town?—It took 20 days.

10,461. Did you attempt to do it all at once, or was it done in stages?—It was done continuously, people were coming out every day, but we could not get huts or carts or anything to get them out. They were got out as quickly as possible.

10,462. You were not quite prepared for evacuation?—No.

10,463. I suppose if you had been prepared you could have evacuated it very much more rapidly?—Yes, in a few days.

10,464. What was your general experience of the results of evacuation?—I think there can be no doubt that evacuation does stop plague.

10,465. The statistics you have put in corroborate that statement?—Yes. There are some other statistics which I should like to go in, which I have written out. They are as follows:—

* *See* Appendix XXXVII. in this Volume.

* *See* Appendix XXXVIII. in this Volume.

STATEMENT showing Effect of EVACUATION.

Serial No.	Names of Villages.	Date of 1st Case.	Date of Evacuation.	Date of Last Case.	No. of Cases in the Village.	No. of Cases up to 10 Days.	No. of Cases after 10 Days.	Cases contracted by return.	Total Cases.
1	Gunachaur -	February 2nd -	March 1st -	March 28th -	92	43	12	2	156
2	Jagatpur - -	„ 21st	„ 10th -	April 30th -	32	17	9	7	63
3	Masani - -	„ 14th	„ 23rd -	May 6th -	4	22	10	7	36
4	Tahirpur - -	March 8th -	„ 24th -	April 9th -	8	22	2	0	32
5	Mazaranauabad -	„ 20th -	„ 28th -	—	3	0	0	0	3
6	Sotran - -	„ 18th -	„ 24th -	April 30th -	3	10	4	3	17
7	Lidhar Kalan -	„ 25th -	„ 29th -	„ 28th -	6	15	5	3	26
8	Khanpur -	„ 27th -	„ 30th -	„ 26th -	9	11	2	1	22
9	Bika - - -	April 9th -	April 10th -	May 17th -	1	9	6	3	16
10	Sirhal Mandi -	„ 13th -	May 7th -	„ 15th -	55	2	0	—	57
11	Mokandpur -	„ 9th -	„ 10th -	„ 10th -	17	0	0	—	17
12	Lehl - -	„ 12th -	April 18th -	„ 13th -	11	17	6	2	34
13	Chak Kalal -	„ 17th -	„ 17th -	„ 27th -	0	33	0	—	33
14	Punian - -	„ 14th -	„ 24th -	„ 4th -	38	19	1	1	58
15	Rehpa - -	„ 16th -	„ 23rd -	„ 9th -	4	16	1	—	21
16	Gosal - -	„ 21st -	„ 25th -	„ 5th -	3	8	0	—	11
17	Aujla - -	„ 21st -	May 10th -	„ 13th -	8	1	0	—	9
18	Chhokran -	„ 16th -	„ 10th -	June 14th -	13	5	1	—	19
19	Turan - -	May 5th -	„ 25th -	„ 12th -	5	1	0	—	6
20	Kariam - -	September 4th	October 5th -	November 2nd	6	1	3	3	10
21	Rahon - -	November 7th	November 19th	„ 16th	5	0	0	—	5
22	„ - -	December 17th	January 17th -	January 11th -	11	2	In progress.		—

I should like to call your attention to one or two of the most striking cases. In the village of Masani four cases occurred in the village before evacuation, 22 within the first 10 days after evacuation, and 10 after the first 10 days. Now, of those 10 cases which occurred after the first 10 days from evacuation, 7 were known to have gone into the village afterwards.

10,466. What was the population of this place?—1,499.

10,467. What occurred after evacuation?—After evacuation up to 10 days 22 people were taken ill with plague. After 10 days 10 people were attacked with plague—that is, after the 10th day after evacuation.

10,468. Up to what time?—Up to 20 days or more. Of those 10 cases which occurred after the 10th day 7 people were known to have gone into the village site, employed on the disinfecting gang, or to get things from their houses. That is the complete number of cases, no more occurred; the epidemic then ceased altogether. I have put in a complete list of the cases occurring more than 10 days after evacuation of villages in which the persons attacked were known to have gone into the village a short time previously.

10,469. Your observations are all in the same direction, and the effect of evacuation seemed to be extremely satisfactory?—Yes.

10,470. In addition to evacuation, what other measures did you adopt?—After the people have all left their houses the houses and contents are disinfected. I have tried as far as possible to make people take out everything with them so as to have only the houses to disinfect afterwards.

10,471. Were their effects disinfected before being taken to the camp?—No, afterwards.

10,472. How long after evacuation did you disinfect the houses?—Generally 10 days.

10,473. For what reason was that period chosen?—The reason which was laid down for that was this: it was supposed that the epidemic which might occur in rats would have finished in 10 days. The rule had nothing to do with me.

10,474. I think we have been told that you do not adhere to that interval now?—I do not adhere to it, but the rule still exists.

10,475. How is your disinfection effected?—The disinfection consists in disinfecting everything first with strong phenyle solution, then making holes in the roof, and whitewashing.

10,476. What kind of floors had these houses?—All mud floors mixed with cow-dung, and plastered hard.

10,477. Did you find it necessary to remove any of the floor?—It was always done in infected houses.

10,478. How much of the surface?—Three or four inches.

10,479. What was done with that?—It was generally burnt.

10,480. You made holes in the roof?—Yes.

10,481. Did you make any other holes?—There were a few houses in which the damage would have been very great if holes had been made in the roof, and in some cases in such houses they had holes made in the sides, but practically speaking they are always made in the roofs.

10,482. Before you did this had the houses any ventilation openings apart from the doors?—No, very rarely.

10,483. You did occasionally make holes in the side walls?—Yes.

10,484. You did not attempt to make anything like a window? It was just a rough hole?—Just a rough hole.

10,485. A temporary hole which you intended to be filled up afterwards?—Yes.

10,486. On what theoretical grounds do you suppose evacuation is so successful?—I think it removed the people from the source of infection.

10,487. Some infected people also were carried into camp?—Yes.

10,488. How do you account for infection not spreading in camps in the manner in which it would undoubtedly have spread if the people had been left in their own houses?—I cannot account for that. It is certainly curious that the attendants in hospitals do not get attacked. There seems to be a possibility that there is some change in the bacillus of plague after it has left the human body.

10,489. But we know that when people are attacked in hospital they may have virulent plague and die?—Not necessarily.

10,490. Not necessarily, but they may have virulent plague?—Yes.

10,491. Did you find any medical treatment useful?—No, except that on the whole our treatment did contrast favourably with people who were left alone.

10,492. Your patients did rather better?—Yes.

10,493. Was the mortality reduced?—Yes.

10,494. Have you any figures to show that?—No I have not.

10,495. It is an impression on your mind?—Yes.

10,496. What is the treatment you adopted?—It is the same as that given by Captain James.

10,497. What, in your opinion, would be the most important information you could get in regard to an epidemic?—Early notification.

10,498. Have you any suggestion to make as to how this notification might be obtained more certainly and more speedily than at present?—I cannot suggest any means in India by which notification could be obtained.

10,499. Do you mean with the existing machinery, or that it is impossible in any way to do it?—It is impossible without very largely increasing the existing machinery.

10,500. Can you tell us the constitution of the chief Sanitary Authority in the Punjab? It is a Sanitary Board, I think?—Yes. The Sanitary Board in the Punjab consists of the Financial Commissioner, the two Chief Engineers, of the General and Irrigation Branch respectively, and the Commissioner of the Division, either Lahore or Simla. In the hot weather the Board meeting is held at Simla, and the Commissioner of that division is a member; but in the cold weather it is held at Lahore, and the Commissioner of Lahore is a member. The Sanitary Commissioner is the Secretary of the Board. There are four members.

10,501. The Sanitary Commissioner is the Secretary, and not a member of the Board?—That is so.

10,502. What are the functions of the Board?—I do not know whether I could say actually what the functions are, but as far as I know the Sanitary Commissioner makes recommendations to the Board, and they recommend whether they shall be carried out or not.

10,503. Have you had any direct dealings with the Board?—No.

10,504. You are not a member?—No.

10,505. I suppose the Sanitary Commissioner has direct charge of the sanitary condition of the district or division?—There is only one Sanitary Commissioner for the Punjab.

10,506. Who are the Sanitary Officers? Are they qualified men?—There is the Deputy Sanitary Commissioner; then the Civil Surgeon in each of the districts is the Sanitary Officer for that district.

10,507. Have you any idea of the population of the district under the Sanitary Commissioner?—It is the entire Punjab.

10,508. And the Civil Surgeon?—Civil Surgeons have districts, of course, varying in size. I really do not know what the size of the district is. In those districts in which I have been Civil Surgeon, I suppose the length of the district would be 50 miles.

10,509. What would the population be, roughly?—I cannot tell you.

10,510. A million?—Some hundreds of thousands, I suppose.

10,511. The Civil Surgeon has other duties, has he not?—Yes.

10,512. Will you kindly detail them?—First of all he has to treat all the civil officers of the Government. Then he has the chief dispensary of the district, where

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the vast majority of the operations of the district come in—the serious cases. He has in addition to look after the jail, not only medically, but in all its branches; he is the Superintendent of the jail. He has the medical work of the whole district, and the sanitary work of the whole district, and the jail.

10,513. Is there not an Assistant also?—There are Assistant Surgeons and Hospital Assistants in the dispensaries.

10,514. Is there any special Assistant in the Sanitary Department of his work—in the Public Health Department?—No, except that there are vaccinators.

10,515. (*Mr. Hewett.*) Will you look at the table which Capt. James put in (*see* Question No. 9981) There are one or two of your villages in which a number of cases are entered in the column "H." First with regard to Gunachaur. Can you account for the occurrence of those cases so long after evacuation?—Two of those cases were caused by people returning to the village.

10,516. And the remaining two?—I have no knowledge of them.

10,517. Then at Jagatpur there were five cases?—At Jagatpur seven of the cases which occurred more than 10 days after the evacuation of the village, were known to have got infected from the village by returning to it.

10,518. That is, seven of the cases which are entered in these columns up to 20?—Two of the cases up to 20, and the remaining five.

10,519. There are three cases in Sotran?—Yes.

10,520. How do you account for those?—Three cases are accounted for by people having gone into the village after evacuation.

10,521. That has been definitely ascertained?—Yes.

10,522. The next village is Lidhar Kalan; how are the two cases there accounted for?—They went into the village.

10,523. How do you account for the two cases at Khanpur?—I cannot account for them. There is one case which probably got infected in the village, but I am not sure.

10,524. Then there were five cases at Bika?—Three of them got their infection from the village.

10,525. And the remaining two?—I do not know.

10,526. Then there is Mokandpur?—I cannot account for any of those cases.

10,527. There was one case at Lehl?—That also was infected from the village.

10,528. Apparently it was not uncommon for people to get from the camp back into the village?—I am afraid it was not very uncommon. It was not possible in all cases to cordon a village.

10,529. The cordon, I suppose, was not effective?—Not strictly effective.

10,530. Do you suppose that any sensible proportion of the cases which went back into the village came to your notice?—A certain proportion, I should *think*; it varied in different villages.

10,531. Do you think that the number which did go to the village was very much larger than those reported to you as having gone back?—I should think so.

10,532. You have got the town of Rahon in camp at the present moment?—Yes.

10,533. Can you tell us when plague was ascertained there?—On the 14th November 1898.

10,534. Have you ascertained how the town got infected?—No; the cases which were first discovered were almost in separate quarters of the town.

10,535. Were they discovered simultaneously?—Yes.

10,536. Two cases?—No; there are more than two cases, but three of the cases occurred in one block of buildings, and another in a house some little distance from there.

10,537. Then there were six cases to begin with?—Yes.

10,538. Were you able to ascertain whether any of those six persons had left the town?—Yes.

10,539. Where had they been?—They had been to villages which were known to be affected in the last hot weather—Hansaron, Katharon, and Bhangal. These people were Rawals, low caste Muhammadans, who are petty traders. The man of the family first attacked said he had recently visited this village and had bought chari (Indian corn stalks).

10,540. And taken it to Rahon?—Yes.

10,541. I see that this village of Katharon was declared free from plague on the 28th May?—Yes.

10,542. Hansaron on the 4th June, and Bhangal on the 23rd June?—Yes.

10,543. Have you had any signs of plague in any of these villages in the interval?—No.

10,544. Nor any mild cases of plague?—No. You see these villages are close to Kariam, and they absolutely deny having been to Kariam. There was plague at Kariam at the time.

10,545. When was there plague there?—During November.

10,546. When did plague break out in Kariam?—About the first week in September.

10,547. That is subsequent to Captain James' Report*?—Yes, there was a case of plague at Dasanjh Kalan in the early part of September.

10,548. That was one of those mild cases, was it not?—Yes; there was only one case.

10,549. When did you find the mild cases in Aur?—On the 24th July.

10,550. You found four cases, I understand?—Yes.

10,551. Did any fresh cases occur in Aur?—No.

10,552. From the 24th July onwards what was the first case you found?—The case at Dasanjh Kalan; on 20th August 1898.

10,553. The next place to have plague was Kariam?—Yes.

10,554. Was there plague continuously in Kariam from September until the time it broke out in Rahon?—No. The last case of plague occurred in Kariam on November 2nd.

10,555. It broke out in Rahon 12 days afterwards?—I saw the first case at Rahon on November 14th, but another case occurred at least a week previously.

10,556. Then in point of time the outbreak in Kariam practically extended to that in Rahon?—With the exception of five days.

10,557. Do you think that it is possible that Rahon got infected from Kariam?—Yes, but there is no direct proof.

10,558. How many cases have you had at Rahon since November 14th?—Up to the time I left there were 16 cases.

10,559. Then plague has never been very virulent there?—The cases were fatal.

10,560. The epidemic has not been great?—No.

10,561. How many of the 16 died?—Ten.

10,562. What was the last case you had there?—I have handed over Rahon. The last case which occurred at Rahon altogether was on January 17th. There have been two infections of Rahon. First of all the two infected quarters were evacuated; the people went into camp, and the infected muhallas were disinfected, and a ditch was dug round those infected muhallas to prevent the possibility of rats going from one part of the town to another. That did not answer, but still we had no evidence, so far, that rats did go. The people went out into camp, their houses were disinfected, and after they had been 28 days in camp they went to their houses at Rahon—those two muhallas. After they had been back in their muhallas for six days two cases occurred in a central part of the town, a long distance away from the infected muhallas. The inhabitants of the infected houses were related to the inhabitants of the first infected muhalla, and the first case in the town is said to have received clothes from the house of one of the patients of the first infected house when those patients first went into camp.

* Not published with the Proceedings of the Commission.

10,563. Do you think that it is impossible that the people living in those houses in the central part of the town could have communicated with the others while they were in camp?—It is not impossible, but I think it is unlikely.

10,564. And there had been no cases among those who had been in camp for 28 days before they came back?—No.

10,565. Has there been a case of plague at Multan?—I do not know. That has not been reported to me.

10,566. Do you agree with the rule which prevents disinfection being begun until ten days after the people have gone into camp?—I do not think there is any evidence to support that rule.

10,567. At what period have you been in the habit of allowing people to go back into their evacuated villages?—Twenty-one days after the last case.

10,568. Do you mean 21 days after the last person got infected?—Yes.

10,569. You disregard people who are in hospital?—Not altogether. If you have a person in hospital with a large wound, the result of a bubo, but who has recovered from the plague itself, one neglects that person.

10,570. Then three weeks has been the minimum and not the maximum?—The minimum.

10,571. Did you find any difficulties in carrying out evacuation, owing to climatic or other reasons? Did the rains prevent you?—No. During the rains there were very few villages to evacuate.

10,572. Do you think that it would be possible to evacuate villages on a large scale during the rains in the Punjab?—In that part of the Punjab which I have been in, I think it would be possible to evacuate villages. There is always some land about the villages sufficiently high for the people to go to.

10,573. I think that you said the period of incubation did not extend in your opinion, beyond 10 days?—That is so.

10,574. But you have other ideas as to the life of the organism?—Yes.

10,575. What do you think about that?—It appears to me to be indefinite. I cannot say how long it would live.

10,576. Have you expressed an opinion that it appears to live indefinitely?—Yes.

10,577. Upon what have you based that opinion?—That has not been based upon my own experience so much as from papers I have read. They are referred to in the Report* which you have.

10,578. It is not based upon anything which has come to your notice during your experience of plague in the Punjab or at Bombay?—There was the village of Aur.

10,579. Will you tell us what facts came to your notice there?—The village of Mahmudpur was declared free from plague on the 9th June, and the last case occurred there on the 13th of April. The people who were first affected in Aur had recently come from Mahmudpur, and they say that they had not been anywhere else at all. They had relatives who had died in Mahmudpur from the epidemic, but these people were not attacked. There was nobody attacked in the second outbreak in Aur till the 23rd July.

10,580. In what you call the first outbreak at Aur there was only one case?—Yes; it was a doubtful case.

10,581. So that you do not think that infected the village?—No.

10,582. Then your view would be that although plague stopped in Mahmudpur in the middle of April, those people must have got infected from Mahmudpur?—That is the only source of infection there was, as far as I know, unless cases occurred which did not come to our notice.

10,583. Do you think it is likely that there were such cases?—I do not think it is likely.

10,584. Were you examining the villages closely in the neighbourhood of Aur?—Very closely.

10,585. By the agency of Medical Officers?—Not Medical Officers. There was the Inspection Staff. Aur was the head-quarters of the Inspection Circle.

10,586. Then the possibility of the people of Aur having been infected from some other place is not absolutely excluded?—No.

10,587. (*Dr. Ruffer.*) You stated in answer to the President that in your opinion the incubation period of plague might be less than one day?—Yes.

10,588. Can you tell us the facts on which you base that opinion?—There is the case of Basant Ram, a compounder, who was attacked with plague on May 4, while on duty at Chak Kalal. The previous evening he had gone into house No. 9 in Punian, to get a ruler, before it was disinfected.

10,589. Had he been employed in disinfection before?—Yes.

10,590. Why do you think that in his case the incubation period was only one day?—The Hospital Assistants have been very rarely attacked when on disinfection work, and if they follow the rules—and this man, I believe, did so—they would not expose themselves very much to infection.

10,591. But in spite of these precautions he exposed himself sufficiently to get plague the night before?—Yes; he went into a non-disinfected house.

10,592. Then you have stated that you thought the incubation period might be as long as ten days; can you give us the facts on which you base that opinion?—Only the large number of cases which have occurred within 10 days after removal from the source of infection.

10,593. But the majority of those cases occurred within the first four or five days?—Yes.

10,594. Can you exclude the possibility of the cases which occurred after the fifth day coming in contact with the first case?—No.

10,595. Have you any cases in which people have accidentally inoculated themselves with plague?—No.

10,596. In Rahon you say in the first epidemic you had 10 deaths out of 16?—Yes.

10,597. Were any of those cases pneumonic cases?—No, all bubonic cases.

10,598. Do you think a purely bubonic case can infect somebody else?—I think it must, but I do not know how.

10,599. Then you told us that in Jagalpur out of 10 cases of plague 7 cases got the infection by going back to the village?—Yes.

10,600. How long after going back to the village did these people show symptoms of plague? Have you the dates of their going back to the village, and the date on which the plague broke out?—I have not got it, but I can get it.

10,601. Are you quite sure that they only went back once in any of these cases?—No, I am not at all sure of that. I know in some cases they went back several times.

10,602. I suppose none of these cases could have caught it from the other persons either in the evacuation or contact camps? Can you exclude all possibility of these cases having got it in the evacuation camp itself?—I cannot, without looking into it more fully.

10,603. Will you look into it more fully and give us exactly the reasons why you think they got it in the town, and the reasons why you exclude the possibility of them getting it in the camp itself?—Yes. (The following information was subsequently supplied by witness):—

INFORMATION concerning PERSONS attacked with PLAGUE more than Ten Days after Evacuation of Villages.

(1.) GUNACHAUR.—One of the two patients who contracted plague after the 10th day after evacuation was a man employed as a watchman in the village. He had been thus employed for a fortnight before being attacked. The date on which the other patient entered the village is not known.

* Report on the outbreak of Plague in the Jullundur and the Hoshiarpur Districts of the Punjab, 1897-8, by Captain James, I.M.S.

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(2.) JAGATPUR.—Four of the 14 cases which occurred here after the 10th day following evacuation were men working in the village on disinfection operations. They were also working the day previous to their attack and most of them had been employed on this work for about a fortnight. Another man admitted to have gone into the village to get something from his shop two days before he was attacked. When he became ill he hid himself in a small house in an adjacent garden and there infected another man who lived there alone. Another patient was attacked with plague 7 days after going into the village to get something from his shop.

(3.) MASANI.—Of the 12 cases occurring after the 10th day following evacuation three were attacked while whitewashing their houses in the village; 3 others had been working at disinfecting operations some days previous to their being attacked. One patient admitted having gone into the village several times before being attacked and had done so 3 days before becoming ill.

(4.) SOTRAN.—The dates on which the people who were attacked with plague after the 10th day following evacuation are not known. Three of them admitted having visited the village within a few days of their having been attacked.

(5.) LIDHAR KALAN.—Reliable information is not obtainable concerning the mode of infection of three of the five cases of plague occurring after the 10th day after evacuation. One man was working in the village for some days before he was attacked, and another admitted having entered the village the night before he became ill to get something from a house.

(6.) BIKA.—Two of the cases occurring after the 10th day following evacuation had worked in the village for some days previous to their being attacked. Another patient was attacked the day after he went into the village to get something from his house.

(7.) LEHL.—Two of the cases occurring later than 10 days after evacuation were men employed on the disinfection of the village. The third case was that of a constable who admitted having visited the segregation camp, which was against orders, shortly before being attacked; it is most probable that he visited the village also, but definite proof is wanting.

(8.) CHAK-KALAL.—On April 4th or 5th dead rats were found in the village, which had died of plague. The people thereupon left the village, but on April 15th a heavy shower of rain caused most of them to return. The first case of plague occurred on April 17th, and 33 persons were attacked between that date and April 27th, all the patients being attacked while in camp.

(9.) PUNIAN.—At Punian the only case occurring after the 10th day after evacuation was that of a compounder who became ill the day after entering an infected house.

(10.) KARIAM.—The three cases occurring at Kariam more than 10 days after evacuation were all persons working in the village. Of these, the first worked in the village daily for seven days before he became ill. Another had worked in the village between October 25th and 29th inclusive, and was attacked on November 1st. Another who had worked on the same days was attacked on November 2nd. It is not possible to prove that none of these cases could have contracted plague in the camps, but from the fact that all articles removed from the villages were systematically disinfected within a few days after being brought into camp, it would seem most likely that little or no infection could be got in the camps. The large number of attacks after the 10th day following evacuation that can be accounted for by persons having entered the village is strong presumptive evidence that infection was obtained in the village; it should be remembered also that it is likely that some of such cases about whom no definite evidence is forthcoming, owed their attack to surreptitious visits to their houses.

10,604. Were you able to make any bacteriological diagnoses during your term of office?—No, only microscopical.

10,605. You have no apparatus and no provision in the Province for bacteriological work?—None available to me.

10,606. Does the Government provide you with a microscope?—No.

10,607. Or with cultivating media?—No.

10,608. You have to get your microscope and cultivating media yourself?—Yes.

10,609. I simply want to know whether the Government makes any provision for that?—No.

10,610. Anything you want of that sort you have to pay for yourself?—Yes.

10,611. (*The President.*) Have you ever asked the Government for anything?—I did when I was in Bombay, and I found it entailed a great deal of correspondence; and as what I bought only cost 100 Rs., I did not go on with it.

10,612. Did you ever ask the Government for a microscope?—No, I had got one.

10,613. Did you ever ask the Government for cultivating media or any bacteriological apparatus?—No.

10,614. (*Dr. Ruffer.*) Do you think you would have got it if you had asked?—I should think it is very doubtful.

10,615. (*Mr. Cumine.*) I suppose ideal evacuation would be an evacuation which makes an attack stop 10 days after the people have gone out, taking 10 days as the incubation period for those who already had the poison in them when they went out?—Yes.

10,616. What are the conditions necessary for making evacuation effective? One would be, I suppose, that the people should all be got out at once; not in detachments, lest each detachment, as it came out, might bring out from the poisoned site fresh infection to the people already in the camps?—They should be evacuated as quickly as possible.

10,617. Another point would be to prevent them revisiting the infected site?—Yes.

10,618. A third would be to prevent cases that developed in camps infecting other people in the camps?—Yes.

10,619. And the fourth would, I suppose, be to prevent any infected clothes in the camps from infecting people?—Yes.

10,620. With regard to the Tables (*see* Questions 9981 and 10,235) which have been given to us by Captain James, in how many cases do they show the evacuation as having been entirely effective in stopping plague within 10 days? In only 14 cases?—Yes. Kariam was another one, as far as that is concerned, because the people who were affected after 10 days were people who worked on the disinfecting gangs.

10,621. *Primâ facie*, those tables would seem to show that in only 14 cases did the plague cease within 10 days after evacuation. But I would put it to you whether those tables are quite fair to evacuation; for they include, do they not, people whom you deliberately sent into the infected village site to disinfect?—Yes.

10,622. And those people, of course, inasmuch as evacuation was temporarily suspended in respect to them, must not be counted against the efficiency of evacuation?—No.

10,623. Can you mark in the tables showing the effect of evacuation on the epidemic in Jullundur and Hoshiarpur (Question 9981) the people who were sent by you to do disinfection work? Can you mark them in red ink, or in some other way, which would enable us to recognise them?—Yes.

10,624. Then the table would be more favourable to evacuation than it is now?—Yes, that will be so. I prepared this table last night. I took the details from the villages which were already printed, and I simply tabulated them—the same villages which are put here—but in many of them I have rather later information than Dr. James, because I was on the spot, and he had taken away such evidence as he had got up to the time, so that in many of these cases his table does not quite do justice to evacuation.

10,625. I should be glad if a table could be put in which would do complete justice to evacuation?—I will put this table in. (The following table was subsequently supplied by witness):—

TABLE to show Effect of EVACUATION of VILLAGES on the EPIDEMIC of PLAGUE.

Serial Number.	Corresponding Numbers in Table IV. of Captain James' Report.	Name of Village.	Probable Date of Outbreak.	Date of Evacuation.	Number of Cases in Village before Evacuation.	Number of Cases occurring up to 10 Days after Evacuation.	Number of Cases occurring after the 10th Day after Evacuation.	Number of Cases in Col. 8 known to have visited Village shortly before being attacked.	Number of Cases in the previous Column employed on Disinfection.	Total Cases.	Remarks.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	
1	8	Gunachaur - -	2.2.98	1. 3.98	101	43	12	2	0	156	
2	13	Jagatpur - -	21.2.98	10. 3·98	32	17	14	7	4	63	
3	24	Masani - -	24.2.98	29. 3.98	8	16	12	9	7	36	
4	30	Tahirpur - -	8.3.98	24. 3.98	8	22	2	0	0	32	
5	31	Mazara Nauabad -	20.3.98	21. 3.98	1	2	0	0	0	3	
6	33	Sotran - -	18.3.98	24. 3.98	3	10	4	3	0	17	
7	36	Lidhar Kalan -	25.3.98	29. 3.98	6	15	5	3	1	26	
8	37	Khanpur - -	27.3.98	30. 3.98	9	11	2	1	0	22	
9	49	Bika - -	9.4.98	10. 4.98	1	9	6	3	2	16	
10	51	Sirbal Mandi -	13.4.98	7. 5.98	55	2	0	0	0	57	
11	53	Mokandpur -	9.4.98	10. 5.98	17	0	0	0	0	17	
12	55	Lehl - -	12.4.98	18. 4.98	11	17	6	3	2	34	
13	56	Chak Kalal - -	17.4.98	7. 4.98	0	—	33	33	0	33	
14	57	Punian - -	14.4.98	24. 4.98	42	15	1	1	1	58	
15	61	Rehpa - -	16.4.98	23. 5.98	7	13	1	0	0	21	
16	62	Gosal - -	21.4.98	22. 4.98	3	8	0	0	0	11	
17	66	Aujla - - -	21.4.98	13. 5.98	8	1	0	0	0	9	
18	67	Chhokran -	16.4.98	10. 5.98	13	5	1	1	1	19	
19	72	Turan - -	5.5.98	25. 5.98	5	1	0	0	0	6	
20	—	Aur - -	21.7.98	10. 8.98	4	0	0	0	0	4	
21	—	Dasanjh Kalan -	20.8.98	26. 8.98	1	0	0	0	0	1	Partial evacuation.
22	—	Kariam - -	18.9.98	6.10.98	5	2	3	3	3	10	

This table is intended to show the effect of evacuation of villages upon the course of an epidemic of plague. It is taken from Table No. IV. on page 18 of Captain James' Report (*see* Question 9981), and is corrected and amplified as regards the villages under my care. Attempt has been made to show more clearly the effect of evacuation in checking the disease than was possible with the information at Captain James's disposal. The number of persons attacked while employed on disinfecting operations has been shown in column 10 of the table.

10,626. Remembering what I said as to the conditions for making evacuation ideally effective, what do you think is the largest village in which evacuation can be made ideally effective in the way of stopping plague within 10 days?—What you want to do is to stop the infection of the people you get out of the infected area within 10 days; because in a large village you cannot possibly get out the people in 10 days, therefore you cannot stop it in 10 days.

10,627. I want to know the largest sized village in which you can stop it within 10 days; in which you can get the people out immediately, and prevent them revisiting the infected site, and can detect cases occurring in the camp, and isolate them so as to prevent other people in the camp being infected. I do not want an exact figure—500 or 2,000, or something of that sort?—I should limit that ideal to 2,000.

10,628. Would you look at the population of the 14 villages in which, according to the statement (*see* Question 9981), the plague stopped in 10 days. I think the largest is about 1,350,is it not?—About 1,403—there is Kariam, another one, which is 1,800.

10,629. So that you would put down about 2,000 as the limit?—Yes.

10,630. (*The President.*) I do not quite understand how you fix 2,000 as a limit?—Because it is possible to get 2,000 out in a day, and I think that is the limit, if one takes 10 days as the incubation period of the people on discovery of plague; you cannot get more than 2,000 people out in camp in one day.

10,631. In two days you will get 4,000, and so on?—Yes.

10,632. Supposing you take five or eight days, and get 8,000 out, would not that be an enormous advantage?—Yes, an enormous advantage, but I do not think it is fair to regard 10 days as the ideal.

10,633. It is not a fixed quantity?—No, it is not absolutely a fixed quantity.

10,634. So that evacuation, even if it were put in force in regard to a town or village of 10,000 inhabitants, would it, in your opinion, result in an enormous benefit?—Yes, in an enormous benefit; it is the only thing to be done.

10,635. More than that could be carried out?—Yes.

10,636. (*Prof. Wright.*) What do you think is the best policy to adopt to prevent the spread of plague through an infected area; would you draw a cordon round, or do you think that the system of inspection in the surrounding villages would be preferable to drawing a cordon round an infected village?—I think you should have both. I do not think you could have one without the other.

10,637. You think that one without the other would not be effectual?—I do not think it would, because if you had only inspection it is not possible of course to detect every case of plague, as there may be persons who are already in the incubation stage. It is impossible to detect those cases, and if you had only inspections you could not prevent the spread of plague.

10,638. In the case of Hardwar, we had it in evidence hat when the town was evacuated, a great number of surrounding villages were inspected in order to prevent the spread of plague through the country. A system was inaugurated of inspecting the inhabitants of the surrounding villages twice or three times a week. Do you think that is a better way of preventing the spread of plague through a district from an infected village than the method of drawing a cordon round that village?—No, I do not think it is.

10,639. I want to draw out from you what are your reasons for thinking that the system of putting a cordon round is a better way of preventing the spread of plague than the method of instituting inspections in all surrounding villages?—Because the system of instituting inspections of surrounding villages is exceedingly disagreeable to the villagers themselves, and it is also very hard to carry out, and very fallacious, because we have evidence in the Punjab of one case in which there was, to my knowledge, an exceedingly careful inspection, and there were actually plague people in the village. There was a woman ill in a house; a friend of hers had come from another village, and at the inspection—there is a roll-call of the village, and every person's name is called out to appear—when the sick woman's name was called out another woman appeared for her. This woman, after the inspection was over, went back to her own village, and she was the first case of plague in that village.

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10,640. You think inspection would fail because cases would be concealed?—Cases would be concealed, and it would be impossible to discover them.

10,641. Have you seen any œdema in the front of the chest in the case of plague corpses?—No.

10,642. I mean in pneumonic cases?—No.

10,643. You have not noticed any œdema except in contiguity of the buboes?—No, I have never seen any except in contiguity of buboes.

10,644. Have you seen any inoculations done with M. Haffkine's fluid?—Yes, I suppose I have done about 1,000.

10,645. Have you seen any evil results from it?—Beyond pain and fever, no.

10,646. Have you inspected the people after you have inoculated them?—Yes.

10,647. How soon after?—The next day. I inoculate one day, and the next day I go round and see the people. The Hospital Assistant in the meantime sees them, and if there are any very bad cases he takes the temperature. In other cases he does not do that; he sees the man has fever, and asks him if he has any particular pain, and often, of course, the patients show the place where they have been inoculated, if it is very swollen.

10,648. Do you happen to know how long the local soreness persists in the case of inoculation? You say you inspect the next day?—Yes. The local soreness persists rather badly up to three or four days. I have been inoculated myself, and I find there is considerable discomfort.

10,649. Have you examined any considerable number of cases at a period of, say, a fortnight after inoculation, to see whether local soreness still persists?—I have not examined them personally, but there have been men constantly under my eye, and it has not been such as to make them complain of it.

10,650. (*Dr. Ruffer.*) I believe you have examined Professor Haffkine's fluid bacteriologically?—Microscopically.

10,651. In how many cases?—Six bottles some time ago, and six bottles recently—12 bottles altogether.

10,652. Did you find living micro-organisms in them?—In two bottles.

10,653. How did you judge they were living?—I made hanging-drop preparations of the sediment. I dipped a sterilised needle into a bottle, taking some of the sediment from the bottom, and made a hanging preparation from that. In two specimens I found living bacilli.

10,654. How do you know they were living?—I saw them moving—they were motile.

10,655. They were not plague bacilli?—No, they were not plague bacilli.

10,556. Did you see any micro-cocci?—I think there were both micro-cocci and bacilli.

10,657. The micro-cocci were not moving, of course?—No. Afterwards I stained these things; but as I had only methyl violet, it did not stain properly.

10,658. Did you make any stained preparations from other bottles?—Yes; I made stained preparations from six bottles.

10,659. Did you find any micro-organisms which looked quite unlike plague?—Yes; in all the six bottles I found micro-cocci.

10,660. (*Mr. Hewett.*) Was the special inspecting staff for detecting cases organised upon the system adopted in the tract of country near Hardwar?—I do not know what system it was based upon.

10,661. (*Prof. Wright.*) When you say it is the order not to begin disinfection for ten days after you have evacuated, who gives the orders under which you act?—The Commissioner of the Division.

10,662. He gives you a set of rules which you carry out?—Yes.

10,663. Do you know where he gets them from?—No.

(Witness withdrew.)

Capt. W. R. Clarke, I.M.S.

Captain W. R. CLARKE, I.M.S., called and examined.

10,664. (*The President.*) You are in the Indian Medical Service?—I am.

10,665. What are your medical qualifications and what is your official position in India?—M.B., Aberdeen, and M.R.C.P., London. I am Civil Surgeon of Umballa.

10,666. (*Prof. Wright.*) I understand you have had some experience of plague inoculations?—I have.

10,667. Where did you inoculate against plague?—I inoculated in the Hoshiarpur district.

10,668. Was there plague in that district at that time?—There was plague in it at the time.

10,669. Perhaps you will tell us some particulars of what inoculations you did?—Captain Hunter and I did about 1,400 inoculations in Garshankar Tahsil during the months of May, June, and July.

10,670. Were those done in the villages where there was plague?—They were all done in the villages where there was plague.

10,671. Were there any statistics collected as to the incidence of plague among the inoculated and the uninoculated?—There were no cases of plague amongst the inoculated.

10,672. There were many instances in these villages among the uninoculated?—Yes.

10,673. Do you know what percentage of the uninoculated got plague?—I cannot give you the percentages. I have not been able to obtain the statistics since.

10,674. Are there no records at all of the number of plague cases in Garshankar?—There are records of the number of cases that died, but they are very defective. The fact of the matter is that these records were collected within the last few days, and they have not been collected satisfactorily. A statement of the gross mortality from plague, week by week, before and after the 11th of May, the date of the introduction of inoculation in Garshankar, has been made out as follows:—

Week ending.	Deaths from	
	Plague.	Other Causes.
7 April, 1898	16	7
15 „ „	29	9
22 „ „	26	7
30 „ „	37	17
7 May, „	37	1
15 „ „	5	3
22 „ „	1	4
31 „ „	1	3
	152	51

10,675. How many inhabitants are there in Garshankar town?—Between 5,000 and 6,000 inhabitants.

10,676. How many inoculations did you do in Garshankar?—We did 801 inoculations in Garshankar.

10,677. Do you know how many cases of plague occurred before you did these inoculations?—No; I can tell you how many cases of plague occurred after these inoculations. Only five cases of plague occurred after the inoculations had been begun.

10,678. That is in the whole town?—Yes.

10,679. None of these were among the inoculated?—No, none of these were among the inoculated.

10,680. Have you any other cases which would enable us to judge whether inoculations were effective in conferring immunity?—The only cases I have are merely cases where you have plague picking out uninoculated members of a family,

10,681. Will you give us some specific instances of such cases?—In Garshankar the last case which occurred was in an uninoculated disinfecting coolie, who worked in the same gang with his brother, at the same work, and was apparently subject to exactly the same conditions as his brother, who was inoculated. The former got plague and died, but his brother, who accompanied him to the hospital and nursed him till he died, remained well.

10,682. That means that one uninoculated person got plague and one inoculated person did not get plague?—Yes.

10,683. Have you any more striking cases than that?—I have got other instances of that sort.

10,684. I understand you inoculated a great number of men who were engaged in disinfection?—I inoculated the disinfecting gangs as much as possible.

10,685. Do you know what the mortality had been in those disinfecting gangs before you inoculated?—No; all I know is that cases had been occurring in the disinfecting gangs in every village that was being disinfected.

10,686. In the villages which were disinfected by the inoculated gangs was there an immunity from accident?—The only accidents that occurred after we began the inoculation of the disinfecting gangs were amongst the uninoculated. We had one case of plague in Garhi, in an uninoculated member of the disinfecting gang, and one case of plague in Garshankar in an uninoculated member of the disinfecting gang, and one case in Bilron in an uninoculated member of the disinfecting gang; three cases.

10,687. That is in three cases where you had gangs which were partially inoculated?—Yes, partially inoculated.

10,688. In these cases plague occurred three times amongst the uninoculated?—Yes.

10,689. Were the uninoculated fewer in proportion to the inoculated in those gangs?—The uninoculated were smaller in proportion in most of the gangs—in Garshankar, for instance.

10,690. What was the proportion of the inoculated to uninoculated in these gangs?—In Garshankar there were about 800 people employed in disinfection from first to last, of whom 700 were inoculated. The one case that occurred was amongst the hundred uninoculated.

10,691. In the other two gangs in which the two other cases of plague occurred, what was the proportion of uninoculated to inoculated?—In Bilron, the proportion was the reverse. There were few inoculated there in the disinfecting gang, nine men only. The nine men had no cases, but of upwards of 50 who were uninoculated there was one case.

10,692. Is that worth nothing as evidence in favour of inoculation?—No.

10,693. What was the third gang?—The third case was at Garhi. There were 64 inoculated in the disinfecting gang.

10,694. How many were uninoculated?—I cannot give you the exact figures, but there were about 20 uninoculated.

10,695. Sixty inoculated and 20 uninoculated?—That is so.

10,696. You had one case amongst the 20 uninoculated and no case amongst the 60 inoculated?—That is so.

10,697. Have you any other facts than those which bear on immunity from plague?—No, I have really no other facts with regard to it.

10,698. Did any evil results follow from the 1,400 inoculations done by you and Captain Hudson?—None, practically.

10,699. Did you see the people after you had inoculated them?—I saw them.

10,700. Did you see them casually, or were they instructed to come up and report themselves to you?—I inspected them afterwards.

10,701. You saw no real evil effects?—No, no real evil effects. I was rather afraid about one old man who had been inoculated. It was an old hakim, who was one of the first to offer himself for inoculation in Garshankar. I gave him a very small dose.

10,702. Why did you give him a small dose?—Because he was an old man.

10,703. What was the dose which was administered to this old man?—It was equal to 1 c.c. of the standard solution.

10,704. What was the dose prescribed on the bottle?—The dose of 1 c.c. was of the standard solution.

10,705. Do you remember what the dose was which was prescribed on the bottle? I understand that Mr. Haffkine's system is to take 2·5 c.c. as his standard dose, and to prescribe a definite multiple of that standard dose?—I always noted down the dose "as reduced to standard."

10,706. Do you remember in this case what amount of fluid had to be injected—how many times the standard dose ought to have been administered?—No, I think it must have been $2\frac{1}{2}$ times the standard dose, because it was amongst our first inoculations, which were all $2\frac{1}{2}$. I gave this man, actually, $2\frac{1}{2}$ c.c. of Mr. Haffkine's solution, which reduced to standard strength would be 1 c.c.

10,707. You gave him $\frac{2}{5}$ of the dose?—Yes.

10,708. Was this old man very bad afterwards?—He was bad for nearly a week.

10,709. Did you give this same vaccine to any other people?—Yes.

10,710. Did you find that it produced very severe symptoms in any of them?—No, in none of them.

10,711. Then severe symptoms were produced only in this individual case?—It was only in this individual case.

10,712. Did this tend to frighten people off from inoculations?—No, because the old man was very cheery, and he did not lament about it.

10,713. Have you ever seen any abscesses occurring?—In one case, a small abscess.

10,714. Do you think that was due to the fluid?—Probably due to some defect in the antiseptic precautions.

10,715. Do you know whether some local soreness lasted for a number of days afterwards?—In the generality of cases it did not last for more than five or six days. In the great majority of cases there was a good deal of swelling, of course, for a considerably longer time.

10,716. Have you seen the local soreness and the redness and swelling persist longer than five or six days?—Yes, for much longer than five or six days.

10,717. How long have you seen it persist?—For 10 days or a fortnight.

10,718. You say you have seen urticaria resulting, have not you, after inoculation?—Yes.

10,719. How many cases did you see—was it a large percentage or a small percentage?—A small percentage, 5 cases out of 1,400.

10,720. Did you ever give two inoculations?—Yes, in one or two cases, but only in one or two.

10,721. Did you notice that the symptoms were less severe after the second inoculation than after the first?—In one of the cases, which was that of a Plague Nurse, she had pretty severe symptoms after the second inoculation. The second inoculation was done about four or five months after the first.

10,722. Do you think it would be possible to inoculate all the inhabitants of a village?—I could have inoculated all the inhabitants in Palewal.

10,723. Were the circumstances particularly favourable in that village, or was Palewal a fair sample of a village in the Punjab? In other words, do you think, given that plague was in the vicinity, that you could succeed in inoculating every person in an average Punjab village?—No, it would be very difficult.

10,724. Then you had exceptionally favourable circumstances in that village?—I had exceptionally favourable circumstances in that village.

10,725. What were those exceptionally favourable circumstances?—The people had seen plague all around them, and they themselves stood alone. It was the last village—a little island surrounded by plague villages—and they had seen the discomforts hat the others were subjected to.

10,726. The discomforts of the plague measures employed, I suppose?—Yes, and they were anxious to get relief from those measures. They thought that if they were inoculated they might be allowed to stop in.

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10,727. If the fear of the Government measures was before the eyes of the village, you think you could then succeed, as an alternative, in inoculating everybody in the village?—In some cases I think we could.

10,728. Was there any leader among the natives who brought pressure to bear to get the people inoculated?—Yes, there was a Banniah who took up the thing, and he was anxious to remain in, and not to be turned out, because it was the beginning of the rains. He took the lead in the matter.

10,729. Have you tested for Widal's reaction in the blood of inoculated people?—I have not.

10,730. You suggested that this might be done?—Yes.

10,731. Have you any other facts with regard to your plague experience that you wish to bring out?—The only fact that I wish to bring to your notice is the fact that early and partial evacuation of a portion of the village, and without actual evacuation of the whole village, was, as far as I could make out, effectual in Bilron.

10,732. That involves putting a ring round an infected part of a village?—Yes. Bilron has been urged as an instance where early and partial evacuation failed. There was a partial evacuation carried out there on the 6th of February. Early intimation of the outbreak of the disease was obtained. Three cases occurred among the segregated.

10,733. Do you mean among those who were taken out of that village?—Those who were taken out, yes. But the disease did not spread. The first cordon round this village was removed on the 1st of April.

10,734. Do you mean that the measures which were adopted here were partial evacuation combined with the cordoning off of the infected area, is that it?—Yes.

10,735. Your statement is that you think that partial evacuation and cordoning of the evacuated area was successful?—It was successful in this case, but unfortunately the village got again re-infected.

10,736. From the outside?—From the outside after the cordon was removed.

10,737. Can you give us the facts that led you to think that the further infection did not come from the evacuated area but that it came from the outside?—Rampur Bilron was infected. The people that were infected with their families were removed from the village and put into camp. A few of the houses were thus turned out and a cordon was put round the village.

10,738. Was it put round the whole or only round part of the village?—Part of the village was turned out and a cordon was put round the whole of the village area—the village lands. Of course the unevacuated part was kept under observation too, but the people were not allowed to go out into the evacuated parts.

10,739. There were two cordons, one an exterior round the village lands, and the other an interior cordon round the infected area?—Yes. The cases were early discovered. These measures were taken and no further cases occurred between the 23rd of February and the 12th of April. The cordon was removed on the 1st of April.

10,740. Which cordon, the inner or the outer one?—Both cordons. The whole of the Police were taken away on the 1st of April and the people went out to their far away fields, to which they had previously not been able to get on account of this cordon.

10,741. The village was then declared free, I suppose?—Yes, then the village was declared free. After the removal of the cordon the villagers went out, and one man Muhalla went off to his fields close to another infected village Hajipur. He stayed there for about a week and came back to his home in Bilron very ill of plague and died there on the 12th of April. That was a distinct re-infection of Bilron, but it had nothing to do with the previous infection in which partial evacuation was successful.

10,742. Were the houses in this partially evacuated area disinfected?—Yes, they wese disinfected.

10,743. (*Mr. Hewett.*) Have you anything to say about the spread of plague by rats?—Rats in Garshankar died in the infected pattis—the infected portion of the village. They were alive and healthy in the uninfected portions when the people went out. After the people went out the rats disappeared from the houses and none were found in the uninfected pattis when disinfection was going on, either living or dead—although dead rats in small numbers had been found in the infected pattis during disinfection.

10,744. Did you notice anything subsequent to that with regard to rats before the people returned from the camp?—Before the people returned from the camp I saw rats in the village alive and healthy—plump.

10,745. Apparently returning to the town?—Apparently returning to the town. I more particularly remember them in the infected part.

10,746. Did you see many dead rats in other villages with which you had to deal?—A few.

10,747. Have you anything to say about the spread of the disease by means of clothing?—In Chinkoa. In Kulewal itself there were no sweepers, and Buti, sweeper from Chinkoa, used to work in the house of the Lambardar, Dula Singh. After the death of Chando and Dula Singh, Buti was given some clothes belonging to the deceased persons, which he took away to his own house in Chinkoa. The first case at Chinkoa was an old Chamar who lived in the next house to the sweeper. I am told by an Hospital Assistant in Garhshankar that some of the clothes from this sweeper were given to the old Chamar who was the first case in Chinkoa.

10,748. Can you tell us when the first case occurred?—This occurred on the 21st of April.

10,749. And can you tell us when the death of these two people in Kulewal took place?—No, I cannot tell you that. It occurred before the 15th April. Five or six days before this, Chando, wife of Hira Singh, brother of the Lambardar of Kalewal got plague and died. Dula Singh Lambardar himself was the next case and he also died. The first case was Chando at Kulewal, exact date unknown.

10,750. That occurred a few days before the case at Chinkoa, did it not?—Yes.

10,751. Did this Chamar not go to Kulewal?—No, he had nothing to do with Kulewal.

10,752. Have you any other instances?—One of the cases in Palewal was an old bed-ridden woman who never left the yard, and who lived with her grandson, an inoculated boy. This grandson she used to send daily to the house of Nathu, the village bard, to ask after the health of his family. Nathu's family were the first infected in Palewal. The boy was an inoculated boy. He escaped, but the old woman got plague and died of it.

10,753. He was constantly moving between the old woman and plague people?—He was constantly moving between the old woman and plague people.

10,754. Is there any other case?—There is a case in Parowal which came from Bhajjal. The villagers themselves attribute the introduction of the plague to one Maya, a Jat of Parowal, whose daughter was married in Bhajjal. They say that after the disease broke out in Bhajjal, Maya had several interviews with his son-in-law, Rama, of Bhajjal. At the time plague was declared in Parowal, the worst infected house in the village was that of Maya and his brother, Dari (two deaths and two cases had occurred in two days). Confirmatory evidence of Maya's having had interviews with his son-in-law after the infection of Bhajjal, was received at the time of the disinfection of the personal effects of the people of Parowal. At this time all the people in the house of Maya had died, and the Lambardar of the village took into his custody some embroidered clothes and other female garments which, he said, belonged to the eldest daughter of Maya, who was married in Bhajjal. The probability is that Rama, the son-in-law, finding the disease had broken out in his own village, conveyed all his wife's best clothes over to Parowal, or that the father-in-law came and took them away to avoid the unpleasant and destructive process of disinfection.

10,755. How far is Bhajjal from Parowal?—Quite close.

10,756. And plague was in Bhajjal at the time that it broke out in Parowal?—Yes, it broke out at the time.

10,757. What are the general results of evacuation?—I think that evacuation stops an epidemic.

10,758. Would you look at the table furnished by Captain James with regard to the villages in your circle (Question No. 9981)? A number of cases of plague occurred

in different villages more than 20 days after evacuation. In Birampur there were 12 cases which occurred after 20 days. How do you account for those 12 cases?—Birampur was the first village in this circle—of course I am only speaking from hearsay. The village site was not cordoned and the people used to come and go into the village site from the camp. Their cattle were kept in the cattle sheds outside the village and there was really nothing to prevent them from coming into their houses during the time.

10,759. In the next village, Purkhowal, I think there were two cases?—I do not know anything about Purkhowal.

10,760. There is apparently a mistake in cases in Rampur Bilron. Ten cases apparently did not occur after the 20th day?—Oh yes, there were a great many cases occurred after the 20th day in Rampur.

10,761. There is a remark in the table—"seven of these cases occurred really before evacuation"?—Yes—13 of these cases occurred in the first 20 days, but it cannot be ascertained on which days they actually occurred.

10,762. That is not Rampur?—That is not Rampur, that is Purkhowal. Seven of these cases occurred really before the evacuation of the village during the month of April. They were not shown in the daily reports till the 7th of June, when on going over the notes of the cases, I found that seven had been entirely omitted from the previous statistics.

10,763. That leaves three after evacuation?—Yes, that leaves three 20 days after evacuation.

10,764. Can you account for the three cases in Rampur Bilron?—One of them was the sweeper that I have before mentioned of the disinfecting gang. Another was a Brahman who had something to do with a girl who was a patient in hospital, and it is believed he visited her in hospital; the third case is the case of a chaprasi who was attending in hospital on his sick wife and child.

10,765. He was known to have visited them?—Yes.

10,766. In the next village there were nine cases?—That was Simul Mazara. I do not know about that at all; it occurred before I joined on plague duty.

10,767. The next case is Bhajjal—three cases?—I do not know Bhajjal either.

10,768. Sadhowal?—I do not know that.

10,769. Hajipur?—I do not know that either.

10,770. Parowal?—That I do not know.

10,771. Garshankar?—The total number of cases is really wrong, but there was only one case that occurred after the 20th day after total evacuation; that was the case of a coolie in a disinfecting gang in Garshankar.

10,772. Then the next one—Sanwali?—I do not know about that.

10,773. Kulewal?—I do not know about that at all. There is no distinct history of how the man got the infection.

10,774. Garhi?—That was a case of a disinfecting coolie.

10,775. Chinkoa?—I cannot tell you about that. There was no distinct history of how the infection occurred. Bhagwain and Palewal had no cases after the 20th day of evacuation.

10,776. I understand that you think that in at least 11 out of the 17 villages infected in your circle, and probably also in the remaining six cases, infection was taken by people who got through the cordon?—It was taken by human intercourse.

10,777. Must not they have got through the cordon; or were there any cases in which you knew that infection was carried before the cordon was established?—There are cases where the infection was carried before the cordons were put on.

10,778. How many cases are there in which you think the infection was carried before the cordon was put on?—Birampur was the first village, No. 1; that was before the cordon. Then Purkhowal was probably through the cordon. Rampur Bilron was infected before the cordon was put on to Purkhowal. Simul Mazara was infected from Shikohpur. I do not know whether the cordon had been put on Shikohpur before Simul Mazara was infected; Dr. James will be able to say. Bhajjal was infected by a Qasai family living in a separate garden, who were not cordoned, of course. Sadhowal we have not got any very clear history about. As regards Hajipur, the history is not clear either. Parowal was probably infected through the cordon. Garshankar was probably infected through the cordon. Sanwali also through the cordon. The second infection of Bilron was not through the cordon. Kulewal was infected through the cordon; Chinkoa was not; Bhagwain is doubtful; Palewal was infected through the cordon.

10,779. Then you do not think that the cordon was very efficient?—No cordon of eight to the mile could be efficient.

10,780. How many to the mile, in your opinion, would be required to make a cordon efficient?—At night a man cannot see more than 30 yards.

10,781. Do you think that if you had a cordon in which the men were not separated by more than 30 yards, persons who were ready to pay would not be able to get through?—I do not know anything about that; I have no evidence as to that.

10,782. Your experience does not justify you in giving an opinion?—No.

10,783. Have you anything to say as to the employment of hakims?—I had no difficulties with the hakims; they assisted me in every way.

10,784. Did they treat the people according to their own methods or according to European methods?—They began with their own treatment; but at the end of the time they were dressing their cases with iodoform, and using antiseptic lotion, like other doctors.

10,785. Do you think that medical officers had to undertake any duties during this outbreak which might have been given to other people?—I do not think it was necessary for medical officers to have to inspect every house that was disinfected; it added greatly to their work. I think that could have been done just as efficiently by non-medical men.

10,786. You had no staff corps officers employed here?—No.

10,787. Could they have done the work just as well?—Except that I think the rank question would have cropped up, and that they would probably have objected to take orders from medical officers.

10,788. What do you think about the rule which prevents disinfection being undertaken within 10 days after a village has been evacuated?—I think it is quite unnecessary.

10,789. What do you think of the rule which prevents the return of a village for three weeks after the last recorded case; do you think that so long an interval is required if the disinfection is complete?—If you can tell the incubation period accurately, I do not think much longer time is required.

10,790. Do you think that the duty of disinfecting is a dangerous one?—To a certain extent it is, if it is not carefully done.

10,791. Is it possible, in your opinion, to exclude danger if you take proper precautions?—If proper precautions are observed, there is very little danger.

10,792. (*Dr. Ruffer.*) You saw the inoculated persons after the operation. How often did you see them—every day for some days?—Every day for a couple of days; in some cases oftener.

10,793. How often did you take their temperatures?—I did not take their temperatures myself.

10,794. How often were the temperatures taken?—They were taken for the first 48 hours.

10,795. Every 12 hours?—Yes, roughly, every 12 hours.

14,796. When is the temperature highest after inoculation?—Usually about 24 hours.

10,797. Did you find with the same bottle and with the same dose the temperature varied very much in different people?—Yes.

10,798. Greatly?—Yes, greatly.

10,799. How much?—Well, one person getting the same dose from the same bottle would have a temperature of 99 degrees, and another person would have a temperature of 101 degrees.

10,800. Did you find that the other symptoms varied very much?—Yes.

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10,801. With the same bottle?—Yes, with the same bottle.

10,802. And with the same dose?—Yes, with the same dose.

10,803. Did you ever have any bottles which appeared to be contaminated?—No.

10,804. How did you standardize the fluid before you used it?—By the labels on the bottle.

10,805. You made no experiments to standardize it?—No.

10,806. Do you think it would have been possible for you to make the necessary experiments to standardize it?—We could not have done it.

10,807. You do not think it is a practical method to leave the standardization of the fluid to the person who is going to inoculate; do you think he has time for that?—He certainly has not time under ordinary circumstances.

10,808. I notice from figures put before the Commission, with your précis of evidence, that the majority of the people inoculated were Muhammadans?—Yes. 1,510 persons were inoculated altogether in Garshankar Tahsil, by Captain Hudson and myself, and by Captain Heard, I.M.S., who started inoculations on 1st April 1898. Of these 475 were Hindus, 699 were Muhammadans, and there were 336 others.

10,809. Are the majority of the population Muhammadans?—In Garshankar, where the largest number were inoculated, I think the majority are Muhammadans.

10,810. Do you find any difference in the number of cases of plague among Muhammadans: do you think the Muhammadans are more liable to it than Hindus?—I do not think so.

10,811. You think they are equally liable?—Yes.

10,812. In your précis you say that laboratory experiments have proved that solutions of phenyle, of a strength of 1 in 200, are insufficient to deal with many pathogenic organisms. I do not quite see how that affects the argument that you do not approve of the method as used by Dr. James. You do not want to disinfect other pathogenic organisms. Is not 1 in 200 sufficient for plague?—I had not at that time seen any experiments with plague.

10,813. Do you think now that it is sufficient?—I think now it is sufficient.

10,814. One in 200?—Yes, I think that is sufficient.

10,815. There are drawbacks to phenyle, are there not?—It is sometimes very difficult to mix.

10,816. Do not the people object to it?—Yes; the people object to it on account of their clothes.

10,817. Why?—Because very often, when it is difficult to mix, it stains the clothes badly.

10,818. And is not the smell rather nasty?—They do not object to that.

10,819. What would you suggest in the place of phenyle for clothes; what do you think could be used?—I think portable disinfectors ought to be used.

10,820. Do you mean steam disinfectors?—Yes.

10,821. Did you find that the medical staff of the hospital was sufficient?—We found it was ample in our circle, but we had a smaller number of cases.

10,822. (*The President.*) Have you seen any cases in which a second attack has occurred?—I have not seen any, but there is one case reported in the Hoshiapur district.

10,823. You did not see it?—No, I did not see it.

10,824. With regard to the measures which you have discussed for checking plague, I see that you put isolation and disinfection in the first position, do you not?—Yes.

10,825. In order to obtain isolation, you draw attention to the necessity for the early notification of cases?—Yes.

10,826. What means would you advocate for obtaining that notification sufficiently early?—The only means by which we could obtain it at present would be by a system of rewards and punishments.

10,827. Has that been tried?—To a certain extent it has.

10,828. And with success?—It has not had much of a trial.

10,829. So far as it has been tried, has the result been encouraging?—I think so.

10,830. (*Dr. Ruffer.*) Do you know who could give us the details of that case of recurrence of plague you mentioned?—From my diaries and notes from Hoshiarpur, I find that the case was reported by Dr. Dutta. It occurred at Birampore, the first infected village in the Garshankar circle, between the 29th January and 15th February 1898, in a girl, who was again attacked three weeks after her first discharge from hospital. The second attack was much milder than the first.

(Witness withdrew.)

Muhammad Nivaz Shah.

MUHAMMAD NIVAZ SHAH, of Garshankar, called and examined.

(Evidence translated by the Secretary.)

10,831. (*Mr Hewett.*) I believe you are a hakim?—Yes.

10,832. Were there any special circumstances calculated to affect the public health in the autumn of 1897 at Garshankar?—In September, October, and November, what are called "kanedas" began to appear. "Kaneda" is a sort of swelling or bubo which appears behind the ear, which mostly goes away of itself.

10,833. Among what class of people did it occur?—Children and young people of 20 or 22.

10,834. Was it accompanied with any fever?—In the end of December and in January fever began to accompany the "kaneda".

10,835. Was there any fever in the cases in the earlier months?—No.

10,836. Can you give us a statement of the mortality of the first three months of 1898 in Garshankar?—From the 1st of January to the end of March 1898 only 39 individuals died in the town of Garshankar—as follows: under 5 years of age, 15; over 5 years of age and under 60, 15; over 60 years of age, 9.

10,837. What is the total population of Garshankar?—6,000; the deaths recorded were nothing extraordinary.

10,838. At that time you saw nothing to make you suspect that plague was coming into Garshankar?—Two kos away in Birampur at that time plague was in the village, while at Garshankar there was this "kaneda" with fever. Nobody died of the "kaneda." There was no blood poisoning with it. As there was bubo and fever with this "kaneda," it had the appearance of plague; but there was every symptom of plague except blood poisoning. People died of plague, but they did not die of this "kaneda"; there was no blood poisoning with it.

10,839. When did you first see a case of plague in Garshankar?—On the 1st of April.

10,840. Had you noticed any mortality among the rats before that date?—No.

10,841. Who was the person that you saw on the 1st of April?—A Rajput, Musammat Barkat.

10,842. On which side of the town?—The family lived on the north side of the town.

10,843. Was there any case at all on the south side of the town before these cases broke out in the north?—No. There was a case towards the west the day before, but the disease did not spread. The disease only began to spread from the cases in the north, which I saw on the 1st of April with Captain Heard.

10,844. Have you any views as to the reason why plague should spread at the north of the town?—In the cold season it is admitted by everybody that this disease spreads with great virulence, and the wind which comes from the north prevails in the cold weather, and is very cold. Therefore it assists the disease. That portion of the city which the cold wind first reaches is naturally that in which the disease is likely to take hold first.

10,845. Have you a map of these cases which first took place in Garshankar?—Yes. (Map* produced and explained to the Commissioners.)

10,846. How many cases occurred in the Rajputs' houses?—Four, within the court yard.

10,847. In how many separate houses?—There are seven houses in that court yard.

10,848. Were the persons who were only actually infected with plague taken out of those houses?—Everybody was taken out.

10,849. In what house did the next case take place?—Towards the east and towards the west, adjoining the first house.

10,850. Who were the people among whom the disease broke out in this second lot of houses?—Butchers.

10,851. Was there any communication between the Rajputs' house and the butchers' house?—There was a party wall between the two. The houses were close together, but there was no communication between the inhabitants of the two houses, they did not have any intercourse with each other. The Rajputs habitually used *that* road and the other people used *that* road (indicating on map). There was no road leading from one house to the other. On the western side of the Rajput's house there were considerable opportunities for mixing with other people, but none of these other people became ill. One of them was a person employed by the Rajputs, who lived outside their house. There were dyers and other subordinates who continually used to visit the house, but they were not infected.

10,852. Were not they infected afterwards?—The four, five, or six that had plague in their house had it because one of the people there was employed by the Rajputs; but it did not extend to any other house in which there was not personal communication between the members of the house and the Rajputs.

10,853. (*Dr. Ruffer.*) Were the roofs flat?—They are flat.

10,854. Could the people not communicate through the roof?—They could do so if they wished; but the Rajputs do not go upon the tops of their houses, and they are not likely to communicate with butchers.

10,855. (*Mr. Hewett.*) What do you say as to the manner in which the disease is communicated?—One method is, I think, by means of rats. I think that the disease is spread in four or five ways.

10,856. Can you specify them?—For instance, through clothes. There are thousands of ways in which it can be spread—by food, clothes, or other things taken from the house in which the disease is into other houses. The disease is spread by articles of food, drink, &c., and by many other methods. I put them all into one category—food, clothes, intercourse, and other things of that sort.

* *See* Appendix No. XXXIX in this Volume.

10,857. Do you think that any particular kind of people are especially liable to the disease?—People who are afraid of the disease.

10,858. Are people of particular temperaments liable to it?—No, it does not depend upon the temperament.

10,859. Did you inoculate any people in Garshankar?—800 or 900 persons were inoculated.

10,860. How many of those did you do yourself?—I inoculated none myself.

10,861. Can you tell us how many Muhammadans, how many Hindus, and how many other classes were inoculated?—In the town of Garshankar, since the 11th of May 1898, 553 Muhammadans, 217 Hindus, and 56 persons of other castes were inoculated. That makes a total of 826.

10,862. Did any of them suffer from any serious symptoms from the inoculation?—They got fever.

10,863. Was it severe fever?—No; 14 per cent. got neither fever nor anything else; 20 per cent. got fever for 10 hours; 45 per cent. got fever for 20 hours; 16 per cent. got fever for 30 hours; and 5 per cent. were ill with fever for three days.

10,864. Who took the temperatures of these people?—I used to estimate their temperatures from their pulse, the medical officers did it with a thermometer; when my estimates were checked by a thermometer, they were usually found to be correct.

10,865. Can you say how far these inoculated persons were protected from plague as compared with the uninoculated?—I believe they were protected.

10,866. Can you give your reason?—Where the fluid is injected it coagulates, it remains in the place where it has been injected. It takes two or three months before the nodulation formed disappears. I believe that this medicine is a good preventative against plague; it is, as it were, a body guard. For instance, if a man should be in the habit of taking opium or arsenic, when he has some of it in his body, taking more will not affect him badly. I have noticed that the injection of the prophylactic has the same effect as an attack of plague; for instance, it gives rise to headache, diarrhœa, and other symptoms. All the signs of plague are caused by it. I have noticed that persons who, if they were attacked by plague, would be affected by headache, are actually affected by headache when the fluid is injected into them, similarly with other symptoms.

10,867. (*Dr. Ruffer.*) Have these butchers and Rajputs got servants, and do those servants live in the house, and do they communicate with each other outside the house?—They have no servants, they are agriculturists.

10,868. Do the dyers who dye for the Rajputs do the same work for the other castes?—No.

10,869. (*Prof. Wright.*) Are these Rajputs Hindus?—They are Musalman Rajputs.

(Witness withdrew.)

Captain DAVIDSON, I.M.S., called and examined.

10,870. (*The President.*) I believe you have just arrived from Multan?—Yes.

10,871. You propose to give us some information about a case of plague supposed to have been infected by clothing sent from Bangalore; who was the person?—A Miss Game.

10,872. She was an Eurasian, I think?—Yes.

10,873. What was her occupation?—She is a Female Assistant Surgeon at the Victoria Jubilee Hospital.

10,874. She acquired symptons of plague?—Yes.

10,875. On what date?—On the 21st of December 1898.

10,876. Do you remember what the symptoms were?—I was not there at the time. I can only tell you what she said when I came back. I did not see her till the 24th when I came back from the district.

10,877. What history of her illness did she give you?—She was suddenly seized with fever and nausea, and within a very short time she began to get a very painful spot on the femoral region of her left thigh. She had high fever and headache. The gland began to enlarge. It was exceedingly painful, and prevented her from sleeping. I saw her on the evening of the 24th.

10,878. What did you find?—I found that her temperature was 101 degrees, and that she had a swelling in the femoral region of the left thigh. In the centre the gland could be felt indistinctly. There was effusion all round, and it was very tender to the touch.

10,879. I believe you attended her for some days?—I attended her till she was better.

10,880. What did you find after your first visit?—The gland continued painful. On the 27th the temperature came down to normal. It rose again that evening, but was normal again on the morning of the 28th. When I detected fluctuation in the gland, I opened the bubo and evacuated about half an ounce of pus. Then the temperature became normal, and she gradually improved.

10,881. On what grounds do you consider this to have been a case of plague?—In the first place there was no cause for it. She had no sore on her feet that could account for it. Then there was the fever before there was any enlargement of the gland at all.

10,882. That is her own account?—That is her own account. I can only go by what she told me. Then there is the peculiar nature of the effusion round about the gland, which, I think, is different from what is generally seen in an ordinary inflamed gland.

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10,883. What was the peculiarity?—Diffuse effusion round about. It is rather difficult to describe. It would be easier to understand by seeing it.

10,884. Was any bacteriological examination made?—No.

10,885. Was there any other case of a similar kind?—No, none whatever.

10,886. This patient recovered?—Yes, she recovered, and was discharged on the 9th.

10,887. I suppose there was no suspicion of venereal disease; did you make inquiries about that?—No; I made no inquiries.

10,888. The point about this case is the origin of the infection. Give us your account of that?—After I had seen the patient, I thought to myself that this looked like a very suspicious case, so I began to make inquiries.

10,889. Your experience of plague has been considerable, I think?—I have seen a good many cases.

10,890. Where?—In the Jullundur district.

10,891. And this case showed general symptoms of plague?—I should say it was plague.

10,892. Please proceed with your narrative?—I inquired if she had seen any suspicious cases or anything, and she said "No." I inquired if she had any relations living anywhere where there was plague, and I elicited the information that her mother lived at Bangalore, and that she had all her clothes made there; she had nothing made locally. I heard that a gentleman friend of the family overheard her talking to his daughter and saying that she had got some clothes from Bangalore, and that the native tailor, who had made them, had plague in his family. After that I questioned her on these points. First she told me that she got the clothes in August, then she said it was September, and, finally, she said she did not get them till October, which, I believe, is about the proper date. About the beginning of October she got some blouses. With regard to the tailor, she began to think it was a case of confinement that had happened in the house. She had worn the blouses soon after they arrived, she had worn them all a good long time before she got ill. I could not elicit any precise or definite information as to when she had actually worn all the three blouses, or how long it was, before she got plague.

10,893. She had three blouses—were they light-coloured or dark-coloured?—I did not inquire into the colour. I only saw them when they were disinfected. I did not look at them particularly.

10,894. There was a long interval?—Yes.

10,895. Did you make any inquiry as to whether there actually was plague in this house at Bangalore?—No. The Resident at Bangalore telegraphed up to me, saying that he had seen a case of plague in a European girl reported at Multan, said to have been infected at Bangalore. He wanted to find out who had sent the clothes which were suspicious. I gave him the address. I know nothing more of what happened at the other end.

10,896. (*Dr. Ruffer.*) Are these blouses worn next to the skin, or are they worn over other garments?—Over other garments, I believe. These were the last garments she said she had received.

10,897. Do you think it likely that she got some linen from Bangalore?—I cannot say. I know everything she got came from there. These are the very last things she said she got; she got them about October. At Christmas time another box came for her.

10,898. Is she married?—I believe she is not married.

10,899. (*The President.*) You say that at Christmas time she got something more?—Yes, a box which was unopened. This box is still unopened.

(Witness withdrew.)

Major Ross, D.L.I.

Major Ross, Durham Light Infantry, called and examined.

10,900. (*The President.*) Have you had much experience of plague?—I was on plague duty in the Poona Cantonment and in Bombay.

10,901. (*Mr. Cumine.*) The Cantonment is separate from the City, I think, in Poona, is it not?—It is only divided by a little nullah really.

10,902. You were put in charge of it in November 1897?—Yes.

10,903. The population was about 15,000 only when you were put in charge?—I should think about that.

10,904. And plague was already bad in the Cantonment—there were about 40 or 50 cases a day, were not there?—Yes, about that.

10,905. You remained there till when?—Till the 3rd of February 1898.

10,906. Did the epidemic continue till then, or did it die out before then?—It had run down almost to nothing. We had a blank day on the 26th of December, and after that we only had one case or two cases in the day—some days blank—up till the 3rd of February, and nearly every case that occurred from the end of December till the time I left was distinctly traceable to the surrounding villages and the people that were coming in. A large number of the people, of course, had left the Cantonment of Poona. The normal population would be about 24,000 I should think, and as the epidemic died out, those people who had been living outside in the villages and other places, and some in Bombay, began to return, and nearly everyone of the cases from the end of December to the end of February were cases that came in from outside places.

10,907. How did you divide up the Cantonment?—As far as I recollect now we divided it into four divisions, and each division was sub-divided into sub-divisions. In some cases there were three, four, or five sub-divisions in a division, and we had a native—generally a pensioned Native Officer, or a native gentleman—who was a supervisor of the sub-division, and he, as far as possible, kept a nominal roll of every soul inside his sub-division. It ran to about 1,000 people to each supervisor.

10,908. How did you discover the cases; did you have a search party?—We had a search party with each supervisor.

10,909. What were the search parties composed of?—European and native soldiers.

10,910. Did they manage to visit every house every day?—I think nearly every house every day.

10,911. That was the way in which the cases were heard of?—Almost invariably.

10,912. Did you get most of the cases before death?—Yes, a great majority of them.

10,913. Did this house searching lead to concealment, or was concealment impossible practically?—It was almost impossible, because our staff was very strong, and we worked from daylight till dark.

10,914. When you found a case, did you remove it to hospital or leave it in the house?—We removed it immediately.

10,915. With the patient who were allowed to go?—One or two members of the family.

10,916. And the rest?—The remainder of the family or the remainder of the people who lived in the same house were sent to a contact camp.

10,917. When you found a case only after death, did you find that the contacts had disappeared?—Occasionally, but not generally.

10,918. Even if they had disappeared could you trace them?—Yes, we could trace them as a rule.

10,919. And find them?—And find them, yes.

10,920. The Cantonments were already infected when you went there; how do you think the infection went from house to house within the Cantonments?—I think by means of the people, and their clothing—and their household effects more than anything.

10,921. At first you did not appreciate the importance of getting hold of the clothing of infected people, did you?—We did not disinfect nearly so carefully when we began as we did latterly, but as we gradually advanced and learnt something more about it, we did

not stop at taking the inhabitants of the house where a case occurred. We took perhaps half a dozen houses close round, and placed the occupants, not in the contact camp, but in the health camp.

10,922. Did cases come under your notice where infection had clearly been carried by clothes?—Undoubtedly, yes.

10,923. Besides human beings and clothes was there any other way in which the infection appeared to spread?—Rats were supposed to carry it, but they were not very numerous, certainly, in Poona Cantonment.

10,924. Did there appear to be some other way in which it spread besides human beings and clothes—some undiscoverable way?—I should think it is probable that the wind blew the germs from place to place.

10,925. Have you got any instances where plague in one house was followed by plague in the house that was back to back with it?—Without aerial communication?

10,926. Yes?—I could not tell you off hand. Plague was very thick with us; in some localities there was hardly a house that was not infected.

10,927. As regards disinfection did you disinfect the room or the whole house?—The whole house, from the roof to the floor.

10,928. With perchloride of mercury? — With perchloride of mercury solution.

10,929. After how many days did you allow the people to go back again into their houses?—After 10 days. That was from the health camp; if they went into contact camp, it was 10 days after the last case occurred among the family that belonged to the house.

10,930. Have you any reason to suppose that perchloride of mercury is an inefficient disinfectant?—I think it is absolutely effective if it is used properly. I think that at first we did not get it all properly mixed. I do not think that the perchloride was always good, but Lieut.-Colonel Fawcett, I.M.S., who was a member of the Plague Committee at Poona, took a great interest in it, and he personally superintended the mixing of this. It was made up in a strong solution and handed out to the disinfecting parties in that form, so that it was really done by experts, and from that time I think it was absolutely effective. We did not dig up the floors, we did not use fire, and we did not use any acid—nothing but the perchloride of mercury.

10,931. You put no acid in the perchloride of mercury? No, we found it destroyed the clothes, and we dipped nearly all clothing.

10,932. How many times did you repeat the disinfection in each room? Did you apply the perchloride only once?—Only once.

10,933. You did not keep on applying it for a week?—No; only once. We tried to get the disinfection done as soon as ever the case was removed—the house and the approaches to the house, privies, and everything connected with it were thoroughly disinfected, saturated with perchloride, and the house was then locked up. The roof was taken off to let the sun in, and the next day the house was lime-washed. All rags and stuff of that sort were dipped with the perchloride at the time of the disinfection. They were left in the house and burnt the following day by the lime-washing parties.

10,934. In any of the houses were there stores of grain, or cotton or clothes for sale?—In the Banniahs' shops there were: they were very hard to deal with.

10,935. How did you deal with them?—We usually placed the goods in the sun for six hours under a sentry when possible, and placed them back again at night.

10,936. By what date were the mass of the people allowed to go back again to their houses?—They went back ten days after the houses were disinfected. All through, from the time I took over, the people were moving back into their houses again every ten days.

10,937. You had no cases of people being re-infected clearly from the disinfected houses?—As far as people from the contact camp are concerned, I cannot speak so definitely because they were so scattered that it was impossible to watch them at the time when the plague was at its height, but the people that were taken into health camp came in large blocks and after they had been ten days in camp. I never saw a case of plague among them after they went back to their houses.

10,938. When did you go to Bombay?—On the 3rd of February.

10,939. What part of the town were you employed in?—"C" Ward.

10,940. Is that Dhobi Talao?—Yes, Dhobi Talao and Market and Fauaswadi.

10,941. Where Captain Bingley was?—Yes, he took over from me.

10,942. How long were you there?—Till the 27th of March.

10,943. Was plague very bad in the Ward when you went there?—It was very bad the whole time.

10,944. You do not know how it got in?—No.

10,945. Do you know how it moved from house to house—by what agency?—Probably in the same way as in Poona, by people and clothing. It was much harder to deal with there, and we could not use the same measures in Bombay as we did in Poona. It was impossible.

10,946. In what way had you to modify your measures?—We were not allowed, as a matter of fact, to remove whole households where a case occurred. A house there very often meant 1,500 people. So the practice was to take one room at a time.

10,947. Had you search parties there?—Yes, for a short time in certain parts.

10,948. What were they composed of?—British and native soldiers.

10,949. Was your information generally got from them or from private individuals?—To some extent from both. As a matter of fact, we used the search parties in very bad localities where the lower-class people lived. We used, really, to make raids on these localities at odd times. We had other means. There were paid informers; and a certain amount of visits were paid by Justices of the Peace at that time. The information was very bad. I do not think we got 30 per cent. of the cases that occurred.

10,950. Could you ensure every house being visited every day as you did in Poona?—No, the population of the ward was about 140,000, and I had 150 men to work it with.

10,951. Regarding those cases you heard of, did you generally hear of them before death or after death?—After death. We did not know where they came from; we only saw the returns from the burning ghats and burial grounds.

10,952. When you found a case before death, did you remove the patient to hospital or leave him in his house?—We removed him to hospital.

10,953. What did you do with contacts when you found a case before death?—To a modified extent they were taken to contact camps—one or two of them—we were not allowed in Bombay to take the whole of the contacts. They said it would cause trouble with the people. As a matter of fact the contact camps in Bombay had about 400 contacts, as a rule. It was the average number, and, I suppose, there were pretty close on 400 cases every day. In Poona we found that it ran to about five contacts to every case, so that there ought to have been at least 2,000 in camp at Bombay, but there were only about 400—generally less than 400.

10,954. When you found cases after death, did you generally find the contacts there or had they disappeared?—They either disappeared or we never heard of them; we lost all touch of them there. We rarely found a dead body in Bombay; they were spirited away.

10,955. What was done to the room in which the patient or the dead body was, in Bombay?—It was disinfected as far as possible.

10,956. Was it locked up?—It was locked up and a pad-lock put on it.

10,957. When were the people allowed to return to it?—In 10 days, as a rule. Ten days was the rule there, the same as at Poona.

10,958. Had you any instances where people got re-infected by returning to the disinfected room?—I cannot remember any particularly in Bombay. We had no hold of the plague in Bombay really at the time I worked there.

10,959. Which of the measures adopted in Bombay do you think produced good and which produced harm?—

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I think that we ought to have worked more systematically. I think if we had taken whole houses instead of rooms, or one family, and disinfected the whole house and all the belongings of that house, and if we had taken the houses gradually straight before us, we would have done more good than by running about from place to place and taking a room here and a room there.

10,960. Have you any experience of that in actual practice—that more good was done by the method you think the better one?—When plague occurred in one room in a house, although you took that room, and probably the family that lived in that room, you would almost invariably find that plague occurred in other rooms in the house within three or four days.

10,961. What is your experience about rats? Did rats appear to be attacked before human beings, or after, in houses?—As a rule, if dead rats were found in a house, almost invariably there was plague in the house amongst human beings shortly afterwards.

10,962. At the end of the epidemic had the rats disappeared?—I was not at Bombay till the end of the epidemic. There was no system of registration of deaths or sickness in Bombay. That was the drawback there. We had no way of checking the returns. We knew that 400 or 500 died in a day there, but we did not know what 200 of the 400 died from. We were never close upon the track of the plague at all. It was always away from us.

10,963. You consider, I understand, that in large places the possible methods to adopt are searching, paid informers, and enlisting the co-operation of the inhabitants themselves, is that so?—Yes; I think those are the only methods possible.

10,964. Do the people like searching?—They are very dead against it. It is the last thing to take to. I think it can only be effective when you have a very large staff in proportion to the population.

10,965. Latterly, in Poona, did you try the co-operation of the inhabitants themselves?—Yes. As we went on with the work the better class of the inhabitants gave us great assistance. They did this more and more as time went on. As they saw good was coming of the work they worked with us, and were of very great assistance to us.

10,966. In Bombay did you try the system of getting the co-operation of the people themselves?—It was just being started when I came away; but it was practically in its infancy. A few of the better class inhabitants in the different districts undertook to look after small divisions, and some of them worked very well; but it had not been really developed into a proper system at the time I came away. I believe that Captain Bingley carried it on afterwards with success.

10,967. Did you have a regular system of hearing complaints in Poona?—Yes.

10,968. Will you describe that?—After the morning work was over in the different divisions, all the officers of divisions, and the supervisors of sub-divisions and myself, met at what we called our Darbar, and anyone who had any questions to ask among the officers asked them. If they had anything to obtain they asked for it. The inhabitants always knew that if they had any complaints to make of the officers, or of the soldiers, if they came they would be listened to at that time. Every thing was settled there and then on the spot.

10,969. Has your experience shown you that the preparation of the perchloride of mercury disinfectant is a matter that ought to be done by trained officials?—I think so, decidedly. I think that until it was done carefully under the supervision of medical men in Poona, it is very doubtful whether it was of good quality. Lieut.-Colonel Fawcett was a member of the Plague Committee there, and he gave a great deal of personal attention to the matter. He trained soldiers in the way of using these disinfectants, he himself, and a Hospital Assistant. He always mixed or dissolved the perchloride of mercury into a strong solution. It was afterwards mixed with a certain quantity of water to bring it to the proper strength of 1 in 1,000. In one ward in Bombay I found that the man in charge of the disinfection was mixing the perchloride of mercury in a zinc bucket with a zinc ladle. He told me that he had always done so. I have been told that this was calculated to destroy the effects of the disinfectant.

10,970. Could you give us an instance from Wanaori, at Poona, of the value of disinfection?—Wanaori Bazar was a very marked instance. The inhabitants there numbered about 600, and plague was very bad. It was decided to put the people into the health camp *en bloc*. About 300 of them voluntarily went into chappars, in the fields, without any disinfection, and the other half—about 300—went into the health camp erected by us. Those that went into the health camp, together with all their household belongings, were disinfected with perchloride of mercury, and after their tenth day in camp they had not a single case of plague. All the houses in the bazar were similarly disinfected with perchloride, and both lots began to return. Out of the 300 that went into the fields, who were not disinfected, there occurred a number of cases after their return to their houses; but among those that had been in camp and had all their effects disinfected, there did not occur one single case.

10,971. Have you noticed anything regarding the permanence of the good effects of perchloride of mercury in a house? that is to say, if a case is imported into a house which has been disinfected with perchloride, does the disease spread?—In the Poona Cantonments, where the people had been placed in the health camps by blocks, and the houses had been disinfected, after their return there were actually no cases amongst those people. Imported cases, however, did come into these districts, but the plague did not seem to spread there. We found the cases promptly, and they were dealt with. There were no cases following. Plague did not seem to spread again in those districts which had been properly disinfected.

10,972. Did anything come under your notice to show that lime alone is not a sufficient disinfectant?—We had a strong party of lime-washing people working systematically through the cantonment, irrespective of cases, taking street by street. When we first began, in the middle of November, I found that numbers of cases occurred in houses immediately after they had been lime-washed, and where no disinfectants had been used before lime-washing. We stopped lime-washing without disinfecting with perchloride, as it appeared to have no effect of itself.

10,973. You mentioned what you thought would be an efficient way of dealing with a ward in Bombay—to begin at one end of it, to disinfect the whole street, and to remove the people into the health camp?—Yes.

10,974. And then let them return?—Yes.

10,975. Supposing that cases were being concealed in other parts of the ward, might not infected rats come from those other parts while this was going on and re-infect the disinfected street again?—My belief is, that after once ground has been properly disinfected it does not easily lend itself to the infection of plague a second time. The inhabitants having been moved once, I think you could impress upon them the necessity of keeping outsiders from coming amongst them. I am sure they learn that. The question of rats is different. In my opinion there is only one way of getting at them, and that is by poisoning freely. You may set up smells, perhaps, but that would be better than having cases of plague.

10,976. (*The President.*) Do you say there was no system of registration of deaths or sickness?—Yes, no system of registration of deaths or sickness. In Bombay I think that is the only way that you could do anything to head the plague by introducing that and making it compulsory.

10,977. (*Mr. Hewett.*) I suppose you would find great difficulties when you have an outbreak such as you had in Bombay in clearing everybody out of the infected houses?—You could not do it—not to take the whole lot at a time. I do not say that was possible, but we had camps capable of accommodating about 20,000 people.

10,978. Whatever system you adopted in Bombay City, would you not have to contemplate people continuing to live in an infected house?—Yes, for a time, under any system, but my idea was to take it systematically from one end of a ward and gradually work through the houses up to the other end of the ward, using the camp which was attached to that ward. I had two camps in my ward, where I could accommodate 10,000 people. If we had been working steadily, taking 10 days for each lot of 10,000 people, we would have got through the ward in time.

10,979. Did you have corpse inspection at Poona?—Yes.

10,980. The whole time?—No, not the whole time; it was introduced latterly.

10,981. Did you find it efficient?—Certainly, when it was done by European medical officers. Of course, I do not know whether their diagnosis was always right, I am not a doctor, but it acted in this way, that when there was any doubt the case was always treated as a plague case.

10,982. You think that it prevented you from missing any cases of plague?—Yes, no body could be removed from one place to another until it had been inspected.

10,983. The people did not object?—No, they submitted. We never had any trouble over that at Poona; but I do not advocate corpse inspection in Bombay; what I advocate is death registration.

10,984. What do you think about corpse inspection in Bombay?—I do not think it would act. The people are not educated up to it. The Muhammadan element is too strong there.

10,985. The Muhammadan element is not strong in Poona?—Not nearly so much as in Bombay; the lower class Muhammadans are a rowdy class. There are large localities purely Muhammadan down there.

10,986. What you think is really required in Bombay is some improvement in death registration?—Yes, I think if you enforce death registration before a body can be removed, you know where every death occurs, and then, if you give the people facilities for registering all sickness by having offices established to do so, and let every case of sickness be inspected by a medical officer, you do away with corpse inspection, which is so repugnant to them. They do not mind living people being examined by a doctor, and their women by a lady doctor. By this means you would see all your cases in life.

10,987. Is it not the touching of the body after death that they object to?—They object to the body being seen or touched.

10,988. You say that there is no system of death registration in Bombay. There is a system, I suppose, but it is not carried out; is not that so?—There was no system that I know of, except that at the burning ghats and at the burial ghats: the name and address of the deceased was supposed to be given, but in most cases a wrong name and address was given, and there was no check.

10,989. (*Dr. Wright.*) You say that an improved system of death registration is necessary in Bombay. What do you think would be gained by it?—I think it is the only possible way of "locating" all cases. In Bombay or any other large town it seems to me that unless it is known where all cases occur, it will be impossible to stamp out the disease. In villages or small towns this is not so necessary, as it is a comparatively easy matter to vacate the whole place.

10,990. Will you describe briefly what system you suggest?—I think a law should be passed, making it compulsory to register all deaths within a reasonable time, say six hours, and making it penal to move a corpse from any one place to any other until the death has been registered. This law would have to be enforced rigidly. In addition to this compulsory death registration, and in conjunction with it, a "voluntary" system of registration of sickness would have to be established. The same staff and the same offices would work both. At first, the offices would have to be numerous, and the staff would have to be large in proportion, so as to give every facility to the people till they were used to the new system; after a time, gradual reductions could be made.

10,991. Roughly speaking, what staff do you think would be necessary?—Taking the population of Bombay at 800,000, and assuming that at first an office would be required for about every 5,000, then 160 offices would be necessary, each office to have a clerk by day and by night, and all in inter-communication by telephone—two doctors to be in charge of, say, 10 offices, one being on duty by day, and one by night. Assuming that the daily death rate ran up to even 320, it would mean about two deaths to be verified by each officer, not necessarily by the doctor, as no corpse inspection is suggested, but by a plague official. This would give each doctor, in his district of 10 offices, say, 20 deaths daily, and assuming that there would be about five fresh cases of sickness for each death, it would mean about 100 cases of reported sickness to be visited every 24 hours, or about 50 for each doctor. In this way, every case of sickness could be seen—treatment and advice, if desired by the patient, would be gratis. The cause of death in all cases so registered and visited would be certified by the doctor, and "all deaths, when "the sickness had not been registered prior to death, "would be treated without further question as plague "deaths." It is not likely that this system could be started and worked immediately without a certain amount of friction. It would have to be introduced gradually and carefully, giving the people time to realise what was required. While an epidemic is at its height, no very immediate or marked effect could be expected; but when the death rate runs down, as experience teaches us it does, during April and May, if every case of plague was brought to light the disease could probably be stamped out entirely.

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10,992. As regards registration, how would it be possible to enforce it in a place like Bombay, where there are numbers of people of the coolie class, without kith or kin, whose worldly belongings consist of a cloth, and possibly a few brass pots, and who live here to-day and there to-morrow? Who would be responsible for registering their sickness and death?—That class either live in (*a*) houses, or in (*b*) open spaces about the town:—

(*a.*) In the former case, house owners or their agents would know about them. House rent in Bombay is high, and as the owners have to pay heavy taxes, they probably allow very few people to live rent free. It would also be to the interest of the other inhabitants to bring to notice cases of sickness in their houses, as, in the event of death occurring, it might save them from having to move.

(*b.*) In the latter case, they would be found by the Police, or by Plague or Municipal Officials on their rounds, and even if they were attacked with plague or died of plague in the open, it would do little towards spreading the disease, as the sun would do all necessary disinfection.

10,993. Would not the expense of the organisation you suggest be considerable?—Yes, and especially as arrangements for isolation, segregation, and disinfection in the usual way would have to be maintained. Still, as it appears from experience that no permanent good result has been attained by the enormous expenditure which has already been incurred, it appears necessary to try some other plan.

10,994. You say that if when the death rate comes down to nearly normal every plague case could be brought to light, you think the plague could be stamped out. Do you, therefore, think that the plague is spread again only by the undetected cases?—Certainly, I think so. It would be hard to believe that the bacillus, which I am told is about the 30,000th part of an inch in height, and less in breadth, would lie in the houses gorged and dormant like a snake for several months, and then suddenly wake up and become active. I believe that when the death rate is normal, or nearly so, and only half-a-dozen cases are reported daily, that there are probably another dozen not reported. I do not think it is the "discovered" cases that spread the plague afresh, every precaution is taken as regards them; but the "undiscovered" cases probably infect numbers of fresh people, and when the climate becomes favourable the disease spreads again.

(Witness withdrew.)

Major T. B. MOFFITT, R.A.M.C., called and examined.

Major T. B. Moffit, R.A.M.C.

10,995. (*Prof. Wright.*) I understand that you took charge of the Shropshire Regiment on its way between Hongkong and Calcutta by the I.M.S. *Warren Hastings*?—Yes.

10,996. When you took over the Shropshire Regiment was the epidemic of plague over in Hongkong?—The last case, I believe, had occurred about three months before they left Hongkong, but of this I have not got any official information; that is what I understand.

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10,997. Were you informed that the Shropshire Regiment had taken taken part in the disinfection operations in Hongkong?—Yes.

10,998. When you received your charge of the men were there any men sick?—There were several cases of venereal disease and malarial fever.

10,999. Had you any cases of buboes on board?—Not that I remember. It is four years ago, and I cannot remember definitely, but there may have been some cases of venereal buboes on board.

11,000. What was your general opinion about the health of the men, was it good taking them generally?—Taking them as a whole it was fairly good, excepting two companies. These two companies had recently been at Kowloon on the China coast, just across the harbour, where there are rifle ranges, and had been living in grass huts. They showed evidence of having suffered from malarial fever.

10,001. There was no suggestion that any of the men had plague on board, was there?—None whatever.

11,002. You did not hear of any mild cases of buboes among the officers or men?—No.

11,003. You do not remember anything to point to plague?—No.

11,004. (*Mr. Hewett.*) Were you with the Shropshire Regiment at all in Calcutta afterwards?—No, I simply went with the Rifle Brigade to Hongkong, and came back straight to Calcutta with the Shropshire Regiment. I returned to my station (Barrackpur) on the day of arrival, and never saw the regiment afterwards.

11,005. (*Dr Ruffer.*) When the regiment left Hongkong, were their personal effects and linen disinfected before sailing?—Not to my knowledge.

11,006. You do not know whether they went through any disinfection process at all?—No.

(Witness withdrew.)

(Adjourned till to-morrow.)

At Government House, Lahore.

THIRTY-FIRST DAY.

Saturday, 21st January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., L.L.D., F.R.S. (*President*).

Mr. J. P. HEWETT. | Mr. A CUMINE.

Mr. C. J. HALLIFAX, (*Secretary*).

Major B. M. Skinner, R.A.M.C.

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Major B. M. SKINNER, R.A.M.C., called and examined.

11,007. (*The President.*) I believe that you were on duty with the Shropshire Regiment in Calcutta in 1896?—I was doing duty at the hospital, and at that time I was in charge of the hospital. The patients I wish to speak about were treated in the hospital.

11,008. During what time in 1896 was it?—It was in the summer of 1896, I think, that the particular scare took place.

11,009. It was rumoured then that there was a form of disease resembling plague in the regiment?—That is what some of the Medical Officers said. There were two doctors there who said that.

11,010. Were they working under you?—No, they were perfectly independent. They started what they called the Howrah case of plague.

11,011. Are you referring to Dr. Simpson and Dr. Cobb?—Yes.

11,012. When they started the Howrah case of plague, did they endeavour to make out that there was a form of fever resembling plague among the Shropshire men?—They tried to make that out.

11,013. The men of the Shropshire Regiment were under your observation?—Yes.

11,014. During the whole of that summer?—Yes.

11,015. Did you notice any unusual form of fever?—Nothing unusual.

11,016. Did any of the patients have buboes?—Yes, that is the point which led to their calling them cases of plague.

11,017. How many men had buboes?—I wrote a short account of it at the time to the *British Medical Journal*. I should like to say that, when I saw this case at Howrah, I wrote to Dr. Cobb, stating that I thought he was creating a scare in the place. I said I did not think they were cases of plague at all, and I could show lots of similar cases among the soldiers: and that I had been watching the cases ever since I had been in the district, which was $2\frac{1}{2}$ years, and before the Shropshire Regiment came. Dr. Cobb at once came down, and not only said that these men had got plague, and took all I said as supporting his statement, but also said that I had got plague. I was sick with dysentery, and during the attack of dysentery I had five buboes about my body; they broke out while I had dysentery. I have not the smallest doubt myself that they had nothing whatever to do with plague. We had been noticing these cases for some time, and we could not make out the cause of the buboes; and at last we put them down to malaria. We were not satisfied that that was the cause, but we thought we might be able to find out what the cause was. I examined the blood of five or six of those cases, and found no signs of what is called the plasmodium.

11,018. That was on the supposition of malaria?—Yes.

11,019. Where did this regiment come from?—From Hong Kong. Hong Kong was their previous station.

11,020. When did they leave Hong Kong?—I think they arrived in Calcutta in January 1895. These cases had been occurring at Barrackpur and Calcutta during the whole time I was there, from 1894, before the Shropshire Regiment arrived. The cases had been occurring among the soldiers; not among that particular regiment. Our work does not lie with one particular regiment. We take all the men who come into our hospital. At the time this was going on some of the cases were among the Artillery as well as the Shropshire Regiment. Previously, while I was at Barrackpur, cases had occurred among the Artillery, and a few of the Sussex Regiment who had been doing detachment duty at Barrackpur.

11,021. Could you give us a description of the symptoms of these cases?—As a general rule the men who came in with buboes were suffering from what appeared to be malarial cachexia; they were anaemic and had the peculiar appearance which malarial patients have. They had a bubo. They became sick because they said this bubo bothered them when they walked about. They generally attributed the bubo to a strain, but when examined as to when the strain occurred they said they did not know.

11,022. Had they fever?—No, not when a man came in with bubo only. Sometimes they did come in with bubo only, and there was no fever at all until the bubo began to suppurate. As a rule they had no fever. I saw one case which came in without fever, and within a few days enteric fever developed. Do you wish me to confine myself to Calcutta?

11,023. I think so, and to this regiment?—I remember several men who were ill with dysentery while in hospital developing these buboes, and several cases who were in with remittent fever. I look upon the fever as an accidental thing and not at all a necessary part of the buboes. Occasionally the men would be in with malarial fever, perhaps with an acute intermittent fever or remittent fever, and while under treatment would develop a bubo.

11,024. Were any of these men suffering from venereal disease?—We always put those suffering from venereal disease in a separate ward.

11,025. What was the duration of the illness?—They went on for about three months sometimes, because the men were in an unhealty state; the buboes often suppurated. Sometimes when it was doubtful whether there was pus or not in them, we opened them and found no pus.

11,026. While in China had this regiment any cases of plague among the men?—I believe they had a few cases, but I have no note of them; I was not with them then.

11,027. Was there anything in the nature of infection observable in these cases? Did it spread?—We never noticed anything of that nature.

11,028. You made microscopical examinations to detect the plasmodium; did you make any for the plague bacillus?—Yes.

11,029. Who did that?—First of all Dr. Simpson and Dr. Cobb took specimens.

11,030. What was the result?—They said there were plague bacilli in them. I have a note here which states that 30 slides of blood specimens, cover-glass specimens, were taken by Dr. Simpson and Dr. Cobb, and only one showed bacteria, which was not the same as in the Howrah case. I saw the bacillus in the Howrah case and it was not the same as the specimens sent from Bombay for Dr. Simpson's inspection; it was a diplo-coccus. It was not the same as in the Howrah case, and the Howrah case was not the same as those which came up from Bombay.

11,031. Who took these slides?—Drs. Simpson and Cobb. I was present at the time.

11,032. Had you often seen the plague bacillus before?—I had never seen it before until Dr. Simpson showed me the specimens which were sent up by M. Haffkine from Bombay.

11,033. Do you know if anything else was done in the way of examining the blood?—Yes, there was some blood taken from the arm in test-tubes.

11,034. Cultures were made?—Yes.

11,035. You did not make them?—No, but I saw them right through. I went to the laboratory afterwards. I saw these test-tubes some time afterwards, but only one of them had a growth in it; the others remained absolutely sterile. The one that had a growth was not the plague bacillus at all; it was strepto-coccus.

11,036. Dr. Simpson made the cultures, I suppose?—Yes.

11,037. Is your view as to the absence of plague bacillus in these cultures the same as Dr. Simpson's, or different?—That is where the difference comes in. I do not know why they said these things had plague bacillus in them. I saw all three specimens, and could not find a single one.

11,038. Have you ever cultivated the bacillus yourself?—Never. My blood was examined also. I was supposed to have these buboes and plague.

11,039. You had buboes?—Yes. I saw the slides prepared from that. I also examined their specimens, and there was absolutely nothing in my blood.

11,040. You saw nothing?—No. Then again Colonel D. D. Cunningham, I.M.S., came down after that to look at these cases of mine, and he took specimens which were absolutely free from any bacilli. As a result of this we looked upon it as an absolute proof that there was no plague at all in Calcutta. Of course, we had an impression before that there was not but this confirmed our opinion at the time. I only took a few specimens, but I can tell you that certainly for three months, with regard to every case which came in, I wrote a note to Dr. Cunningham, who lived near, or took the cover-glass specimens over to his laboratory, and he always did the staining and the preparation of the specimen.

11,041. What is the strength of this regiment?—It is up to strength, I think; about 700 or 800 men.

11,042. And how many cases of this description occurred?—I went through their medical history sheets, which is the record of their diseases. The following account was written somewhere at the end of the year, but it was published on January 9th, 1897. It was written somewhere about the end of October or the beginning of November 1896. The medical history sheets of the Shropshire regiment recorded 79 admissions for inflammation of lymph glands. Of these, after rejecting such cases as looked suspiciously like being, or were noted in the "Remarks" as being, due to venereal disease and irritation, 42 cases remained, which were variously ascribed to the following causes: climate, constitutional, malarial, uncertain, and unknown.

11,043. How many were malarial?—I could not tell you that.

11,044. With regard to those you attribute to malarial causes, had plasmodium been detected?—I examined only five or six cases for plasmodium, and then I gave it up, because I found nothing. Of the 42 cases in the regiment, 13 occurred in Hong Kong, 25 in Calcutta, 2 in Malta, and 2 in England. The preponderance of cases in Calcutta is, of course, due to the fact that the regiment had been here one year and nine months, and consequently many of the men who had had a similar complaint in Hong Kong and more still of those who had had it in Malta had left. Their time had expired, and consequently their numbers would diminish every day. A good many of these cases might be attributed, if a very careful examination had been made, to some little local cause, like "Dhobi's itch," or a boil, or something like that. Perhaps they were not very carefully examined, but to my certain knowledge there was a certain percentage of cases left over which were undoubtedly caused by something of which we had no idea.

11,045. Cases with regard to which it was difficult to form a diagnosis?—Yes, as to their origin.

11,046. Have you encountered these cases anywhere else?—It did not strike me very much before, except at Barrackpur.

11,047. Since then have you seen any?—Yes, I have seen several.

11,048. At Calcutta or at Barrackpur?—At Calcutta, and since I left Calcutta. I have been two years out of Calcutta now.

11,049. Where have you seen them?—In the Punjab.

11,050. Have you seen many?—I was on active service for eight months last year. Then I have generally had charge of wards which did not have buboes in them, what we call "sisters' wards." I have generally had very bad cases to look after, and have not had very much opportunity of seeing them, they being generally placed among the less serious cases. For the last few months I have been in charge of the venereal ward here in which buboes are placed, and I have had under treatment three cases of bubo, for which I cannot give a satisfactory cause.

11,051. Do those resemble the cases you have spoken of?—They are exactly the same.

11,052. (*Mr. Hewett.*) Where is that?—In Mian Mir.

11,053. (*The President.*) Now, as to the locality of these buboes?—They are almost invariably inguinal buboes, in the groin.

11,054. And when they are not?—I have seen one in the arm-pit. Many buboes were in both groins, the right elbow, and on both sides of the neck.

11,055. Have you ever seen any plague cases?—Never.

11,056. (*Mr. Hewett.*) You say that some of these cases occurred in the regiment at Malta; was the regiment then on its way to Hong Kong?—Yes; at the same time I made a note that there was a number of cases in a battery of Artillery which was in the station of Fort William with the Shropshires.

11,057. In addition to those which you have mentioned?—Yes. Eleven of those men had inflammation

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of the glands, and seven cases the origin of which was unknown. Of these three occurred while in Calcutta, two in Allahabad, the previous station, and two in England.

11,058. (*The President.*) Those you have mentioned before were restricted to the Shropshire Regiment?—Yes. I gave you first the figures for the Shropshire Regiment, and subsequently for the battery of Artillery. You understand that I have been in Calcutta. I first met this regiment at Calcutta, and the figures I have given you are taken from their medical history sheets.

11,059. Before this regiment went to China, where there was plague, these cases were occurring among the men?—Yes.

11,060. Is there anything further that you wish to say?—In March 1897, when I first came here, I had a case of undoubted enteric under my care. This case developed a bubo a few days after admission. It ran a non-suppurating course. He had one of those buboes which run right through without suppurating. I wrote an article with the idea of drawing people's attention to this, and to see if some more scientific man than myself would work it out. My impression was that they were possibly due to some infection from the intestine, and the lumbar glands. I am told that that is anatomically impossible, but these inguinal glands are connected with the lumbar glands, and I do not see why the bacilli should not travel backwards.

11,061. You think it was due to some intestinal toxin?—Yes.

11,062. There were no deaths among these people, I understand?—Not one. We never had anything like an acute case. Of course, if we had had a man coming in collapsed with fever we should at once have isolated him, but we never had occasion to do that. There are some figures about these things published by Colonel May in the Annual Report of the Sanitary Commissioner for India.

11,063. Colonel May was the chief doctor in charge?—Yes.

11,064. Amongst the troops affected at Barrakpur before the Shropshires arrived there, were there any soldiers who had come from Hong Kong?—No.

11,065. Will you be good enough to hand in to the Commission clinical records of the cases of lymphatic gland enlargement that have come under your observation?—I regret I am unable to find my notes of cases at Calcutta, which appear to have been lost while I was away on field service, but I hand in notes of three cases under my care at Mian Mir, as follows:—

(1.) Private G., admitted into hospital on 3rd December, 1898. Not long previously, he had been discharged from hospital on recovery from fever which was apparently of malarial nature. On admission he had a bubo in left groin, which he stated came on without obvious cause while he was doing his duty as a soldier. He had never had venereal disease; and on admission had no visible source from which infection could have occurred. The bubo suppurated rapidly and was opened on 24th December, 1898; there was an extensive pus-cavity; the discharge of pus was subsequently very free, requiring daily dressings, but on January 15th, 1899, it had nearly healed. Patient's bowels throughout were regular. He was anæmic on admission, but this improved under treatment. There was no fever throughout the case. On January 31st, 1899, the bubo had healed and patient was convalescent.

(2.) Private M., admitted on 12th December, 1898, with large bubo in right groin. He had no sign of venereal disease, and no visible source of irritation in the skin of buttocks or extremity. On December 24th, the bubo having become semi-fluctuant, it was opened, and found to consist of boggy gland-tissue, non-suppurating. Previous to this and soon after admission, patient complained of internal piles which were large, very painful, and bleeding, but yielding rapidly to treatment. He had suffered from this complaint about one year previously. The bubo was very sluggish, and inclined to continue to break down. On January 10th, a small collection of pus was evacuated from inner part of the bubo; subsequently it had to be freely opened up again; the pus discharged caused numerous secondary pustules beneath the dressing (which throughout the treatment was antiseptic). On January 31st, 1899, the bubo was doing well and healing. There were no febrile symptoms during the whole time patient was in hospital.

(3.) Private P. was admitted on 17th December, 1898. Stated that he first noticed a bubo while at Deolali, having just landed in India, about two weeks before arrival at Mian Mir. He was removed from the train at Mian Mir on 13th December, and prevented going up with his draft to Rawal Pindi, being kept under observation. For five days he had a slight evening rise of temperature. He had not had venereal disease. There was no visible external source of infection. He suffered from constipation, and during the treatment of the case this condition was obstinate. On admission the bubo was hard, of the size of a walnut, the skin movable above it; it was very intractable; on December 27th, suppuration was apparently beginning; on January 11th, 1899, it was opened, but no pus found—the fluctuation being caused by dark fluid blood; subsequently the bubo broke down in a spot apparently not connected with the former opening, and was again incised. On January 31st, 1899, the patient was doing well, and the bubo healing. There were no febrile symptoms after date of admission.

(Witness withdrew.)

[Adjourned to January 23rd at Karachi.]

At The Frere Hall, Karachi.

THIRTY-SECOND DAY.

Monday, 23rd January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., L.L.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Mr. A. CUMINE.
Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Mr. R. GILES called and examined.

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11,066. (*The President.*) You are the Acting Commissioner in Sind?—Yes.

11,067. You have had several outbreaks of plague in Sind?—We have had two.

11,068. To what parts of Sind was the plague confined?—The first outbreak was confined to the three Collectorates. There are five districts in Sind, three Collectorates and two Deputy Commissionerships. The second outbreak was confined to the Karachi district alone.

11,069. Which were the Collectorates involved in the first outbreak?—Karachi, Hyderabad and Shikarpur.

11,070. I believe the city of Karachi is divided into a native part and Cantonments?—Yes.

11,071. What is the population of Karachi?—The actual population, according to the census of 1891, was 98,195 within Municipal limits, and 7,004 within Cantonment limits, making a total of 105,199, of which 52,957 were Muhammadans, and 44,503 Hindus. That is right; but I may say that the opinion of those who are best calculated to judge was that the population of Karachi at the time of the first outbreak was, at least, 130,000. It had increased very much indeed. The estimated increase was 24,800.

11,072. What is the proportion of Hindu and Mussalmans?—Of the 105,200, 53,000 approximately were Muhammadans, and 44,000 Hindus.

11,073. In which part of the city did plague chiefly occur?—Chiefly in the city itself, the native city. I could give you a very short description of Karachi, if you wish it, which will explain how Karachi is divided into three large blocks. The first division is made by a large dry river bed called the Lyari, which brings down water after rain from the hills, but is usually dry—a great open bed—and that cuts off the large area on the north-west, containing about 30,000 people belonging to the poorest classes of Muhammadans. (The witness produced a map* and pointed out the area to the Commissioners).

11,074. Is that the old town?—No, that is not the old town. The poorest classes of Muhammadans are there, persons plying what I may call the offensive trades, such as wool-washing and tanning, people who have been purposely placed there, because of their trades being offensive. There also are the workmen of the harbour; the coolies of the town; and two villages of fishermen. That, *i.e.*, the north-west area beyond the Lyari, may be said to be one great division of Karachi.

11,075. What is the character of the habitations in that area?—Nearly all kutcha huts.

11,076. What do you mean by kutcha huts?—Huts built of wattle or straw, grass and reeds.

11,077. With open walls?—Yes, *i.e.*, with only mat or reed walls.

11,078. Will you now go to the second district?—The second great division is made by the Napier Mole. It separates Kiamari, the Harbour, and Manora from the town by a long roadway. The third and central division of Karachi consists of the city and camp, *i.e.*, the city and its suburbs, and the Camp and Cantonments.

11,079. I am not quite clear which is the third division?—This green area here (pointing to map),* represents the actual old city of Karachi, in which the plague undoubtedly was far worst, and embraces the Machi Miani, Old Town, Market and Napier Quarters. This plague map is coloured on purpose to represent the different divisions. It also shows the camps.

11,080. What is the character of the habitations in the Old Town?—In the city itself they are mud structures, of what we call kutcha brick, that is sun-burnt brick, with very narrow lanes and streets indeed, or of wattle and daub, *i.e.*, a framework of wood in mud-plaster. The houses are very closely packed also, especially in the parts where the plague was worst.

11,081. Can you give any description of a house there? What does a house consist of?—It is generally rather a high structure, with very small rooms and a very tiny staircase.

11,082. How many floors are there?—Generally about three.

11,083. Is each house inhabited by one family?—Generally by one family. We have not what we call the "rabbit warrens" of Bombay to any great extent.

11,084. I understood you to say that they were overcrowded?—Yes, I should say they were over-crowded.

11,085. How is the light and the ventilation provided for?—In some of them it is very bad indeed; in fact, when you get inside you can really see nothing at all.

11,086. There are no openings?—There is extremely little—many and many a room without any except the door.

11,087. Are they very dirty?—Very, especially in the w.c. arrangements.

11,088. What are the faults in these?—It is generally a very dirty shoot down the house from the top floor. A very common custom in Sind—I do not know that it is quite so common in Karachi—is to use the top of the house as a w.c.

11,089. What is the water supply of Karachi?—The Karachi water is brought in for some miles from the bed of one of the hill rivers, the Malir.

11,090. It is a pipe-supply, I presume?—Yes, a pipe-supply.

11,091. Are there any wells in use?—No, there are practically none in use.

11,092. Can you tell us when the first cases of plague occurred in Karachi?—The first known case was discovered on the 10th of December 1896.

11,093. In what part of the city did this first case occur?—The first case was brought to notice on the 10th of December 1896, in the person of a Hindu Brahman cook, who was said to have been taken ill about the 6th of that month in a house in Rampart Road, Bandar Quarter.

* Not published with the Commission's Proceedings.

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11,094. Could you point out the quarter?—*This* is the quarter—in this green part. It is worth noticing that Rampart Road is a remarkably open street for that Quarter.

11,095. The first case, then, occurred in the better part of the bad portion of the city?—Quite a good street—a broad street.

11,096. Can you tell us the general result of your inquiries as to the origin of this case?—I do not think we can say anything, except that it was the general idea that it come from Bombay. Rampart Road is inhabited by merchants who have a great deal to do with Bombay, and it was an unlikely place—this broad open street—for a local case. It was a curious thing if the first local case occurred there; local cases generally occur in the worst places.

11,097. Had this cook any connexion with Bombay, directly or indirectly?—I do not know. My recollection is that there is nothing definite known about it. Dr. Kaka will be the best person to answer that question, but he does not mention it in his "Report on the Outbreak of Bubonic Plague in the City of Karachi during the year 1896-97" submitted to the Municipality.*

11,098. Was there any mortality observed amongst the rats previously to this case?—Not that we know of, in this first outbreak.

11,099. Can you tell us what cases followed this first case?—I notice in Dr. Kaka's Report,* that "on the 11th "December 1896 a case was reported from the Old "Town quarter."

11,100. That is the same quarter?—It is very near indeed; it is in the city block—"and gradually the "number of cases that came to notice increased."

11,101. Was there any connection traced between the first and the second case, and the second and third, and so on?—No, I do not think so.

11,102. Was any connection traced between any of the immediately succeeding cases?—I cannot say positively.

11,103. What steps did you adopt in dealing with the first cases that were made known?—As far as I personally was concerned I was out on tour in the district, and the plague was not declared until the 19th of December. Dr. Kaka will be able to give you the best description of the steps first taken. The ordinary remedies were taken, I believe, of disinfection and cleaning of the house, but there was no attempt at segregation or evacuation until a long time after.

11,104. I understand that subsequently more cases occurred in the same part of the town?—Yes.

11,105. How did it spread from there?—It spread very slowly. The peculiarity of the first epidemic was that it spread very slowly from district to district.

11,106. Can you give us now the total number affected in this first epidemic in Karachi?—Dr. Kaka is the authority on this subject, and he will give you his figures. I purposely left statistics of that kind to him.

11,107. The first outbreak began here in December 1896; can you tell us on what dates it extended from the city to the other quarters of Karachi?—It crossed the Lyari on the 10th of January. The figures are curious, as showing that month by month the disease spread to the different large divisions. It went from the Napier Mole to Kiamari on the 7th February, and across the Harbour to Manora on the 9th March.

11,108. When the disease originally broke out I understand that there was no order for the compulsory removal of the sick?—That is so.

11,109. What were the conditions under which the sick were permitted to remain in their houses?—There was no removal in the first instance at all.

11,110. Cases of sickness were reported?—Yes. On the 7th January I held a meeting with the leading city Muhammadans and spoke to them at length, promising them that the sick should remain in their houses, provided that they would report cases of sickness immediately and allow sickness to be diagnosed and their houses to be disinfected should death from plague occur.

11,111. Were some of the sick removed from affected to non-affected areas?—Yes; they did it without permission.

11,112. Did you make any special rule to deal with cases like that?—Yes, we made a rule preventing them. The Commissioner sanctioned a rule directing that in case the sick migrated from affected to non-affected areas they would be liable to be removed to hospital.

11,113. Then the next stage in the development of your operations, I understand, was the voluntary evacuation of the Nassarpuris on the 24th January?—Yes.

11,114. What were the conditions upon which they were permitted to go into camp?—One of the conditions imposed was that they should be allowed to go and return daily to their business in the city. Had this not been permitted they would never have moved; they were also allowed to bring their sick with them.

11,115. What did the evacuation consist of?—The evacuation consisted of that of a large body of Hindus known as Nassarpuris. The Nassarpuri camp was pretty well known all over India in connection with plague measures.

11,116. What did you do?—First of all the Municipality constructed a large camp for them across the Lyari, here (indicating on map).* When the camp was completed, and after many days spent in negotiations with them, we succeeded in persuading them to go across to it, and they actually moved from the 22nd to the 24th of January. The movement continued, but the greater part of them went out between those days.

11,117. Where did these people mostly come from?—From the heart of this green block (*indicating*)—chiefly from the Old Town and Market quarters. They are scattered about a little, but they all belong to one class of Hindu shopkeepers.

11,118. Why were they selected?—Because I think the plague was worse amongst them than any; it was very bad indeed amongst them.

11,119. It was rather a group of people than a group of houses that was selected?—A group of people, entirely.

11,120. That is to say, the next house might not be taken, but a house further away might be taken?—Quite so. The moving by blocks came later. I can give you the whole history of evacuation quite clearly.

11,121. Before this time plague had occurred across the river, I think?—Yes, it had occurred, but nowhere near the place where these people were. This was a perfectly open piece of clear ground, with no habitations at all upon it.

11,122. What was the result of this partial evacuation, or evacuation of groups of people, generally speaking? Was it successful?—The actual figures will be given to you by Dr. Kaka. They did not return till July. The result was good on the whole, although there were a good many cases.

11,123. Amongst those who were removed?—Yes, amongst those who were removed.

11,124. What was the effect on the part of the town from which they had been removed?—Nothing, except that the empty houses could not have the plague.

11,125. Plague continued to spread?—Yes.

11,126. It did not check the spread of plague?—No. The attempt to stop the plague by removing people from entire blocks was quite a subsequent method in Karachi, and one we carried on largely in the second outbreak. By this time the plague was all over the place.

11,127. In the month of January 1897 you encouraged the people to leave Karachi?—Yes, very extensively.

11,128. At that time the city was very badly infected in certain parts, was it not?—Yes, parts of the city area.

11,129. You had 743 deaths in January from plague?—Yes.

11,130. Were you encouraging people from the worst infected parts to leave the city?—To the best of my recollection we would not allow them to go when they lived close to a case; we encouraged the people beyond to go, those who were still safe, so far as we could judge.

11,131. But the plague was very bad in the Old Town and Machi-Miani, was it not, in January?—They were the two worst quarters.

* Not printed in the Commission's Proceedings.

11,132. Do you mean the worst infected, or the most insanitary?—The worst infected.

11,133. Did these 25,000 people who had left Karachi come to any material extent from those two quarters, do you think?—Yes, I think a great many did.

11,134. Was it not rather dangerous to send them about the country?—As far as possible we did not allow those who were close to the infected houses to go.

11,135. I do not quite see how you were able to prevent them if you were encouraging them to leave the place, and there was no compulsory segregation?—I think I am right in what I say, all the same, that there was very general permission to go, but as much as possible those who lived very close to the infected houses were restricted from going. I said plainly the other day, and I cannot say it more plainly, that in Karachi undoubtedly we got rid of the people. We know now what a mistake it was, but we did it. At the time we did not know it was a mistake. But at the same time we did check as much as possible the people who were actual contacts from going away. It is important to remember that in January 1897 the executive was nominally the Municipality, and although I, as Collector, was really at its head, it is difficult to remember after two years every step which we induced the Municipality to take. I find, however, that after a meeting held at Government House, on the 4th of January 1897, the following resolution was passed the next day by the Municipality:—"That public notifica- "tion should be made to the effect that all persons "suffering from severe fever found attempting to leave "Karachi by train will be immediately sent to the "Municipal hospital provided for such patients." This bears out my contention that, while wishing to get the healthy away before they caught the disease, we did not desire to send the sick or the suspicious. Furthermore, prior to the above date, every person leaving the two railway stations was medically examined, and all suffering from fever detained and sent to hospital, medical examination being held also at important stations along the line for the same purpose; while on the 7th of January 1897, I, as Collector, applied for and obtained the sanction of the Commissioner in Sind to the appointment of four European constables, who accompanied every passenger train leaving Karachi as far as Dadu (over 200 miles), and, visiting constantly carriage by carriage, removed every sick person directly detected, and had them placed in isolated huts built on purpose at the stations along the line. Again, on the 13th of January, the Commissioner in Sind sanctioned a rule, which was embodied by the Municipality in the following resolution, dated 16th January 1897, viz.:— "(1.) No person shall migrate from the Old Town or "Machi Miani Quarter, or any other Quarter that may "hereafter be notified in the Sind Official Gazette by "the President of the Municipality as being affected "by the Bubonic Plague, to any place within Municipal "limits, save to such as may be set apart for the "purpose by the Municipality. Persons migrating as "aforesaid may be permitted by the Engineer and "Secretary or Health Officer to remove their residence "subsequently to any unaffected part of the town. "Such permission shall not be granted unless the person "applying for permission has been under observa- "tion for at least a fortnight." I also find that as early as the 21st December the Municipality passed, and on the 9th of January the Commissioner in Sind sanctioned, rules providing for compulsory inspection, cleaning of houses suspected to contain infected matter, and for the destruction of any hut, building, wearing apparel, or other infected material.

11,136. Among the 25,000 people who left the town there must have been a certain proportion of contacts?—Yes, I daresay there were some; I should be very sorry to say there were not. I do not want to minimise the possible effects of the action taken.

11,137. The next large camp was that across the Lyari, on the 9th February?—Yes, the Gulamshah camp. The village of Gulamshah consists of a lot of huts, which the Municipality had allowed to be erected in a very improper way—all huddled together. It is quite impossible for huts to be huddled closer together.

11,138. What were the walls made of?—Of mats or reeds. That little colony, of which the population was 561, was riddled with plague and small-pox at the same time. It was a matter for immediate measures. We proceeded to erect another camp across the Lyari to which we allowed them to take their own sticks—that is poles, if you can call them poles, they are more sticks than poles—that constituted the frame work of their houses.

11,139. From the houses they evacuted?—Yes, after we had disinfected them. We allowed them to take those poles, and we gave them fresh matting, and allowed them to put the huts up. We thus formed another village and we turned them into it.

11,140. Was that successful?—That was more successful.

11,141. The houses they evacuated were burnt?—They were entirely burnt.

11,142. In your memorandum* on the first outbreak which you presented to the Government of Bombay, you say that rigid segregation as well as universal removal of the sick were measures of gradual growth; I understand that by the middle of February you did move the healthy members of an infected house, that is, the contacts, to regular segregation camps?—Yes.

11,143. Had you a large number of evacuations?—Yes, but as we went on they took different forms. Eventually, we disinfected the whole of the people before we turned them out, till at last we turned people into camps without having any succeeding cases at all.

11,144. After you adopted a system of personal disinfection and disinfection of the effects of the people before they went into camp, you found that the results were much more successful?—Yes, the results were more successful. We dealt also with one of these villages across the Lyari, called Kalankot. We built a large village in order to receive the inhabitants and we then stripped the Kalankot village—entirely stripped the roofs of the houses and had them thoroughly disinfected. We left the poles standing. We turned the Kalankot people into the new camp and six weeks afterwards we let them go back into their houses which had been disinfected. The Municipality paid for re-covering them with new mats. That was very successful. They all came back at the same time.

11,145. And there was not a case of plague?—Practically none. I am sure that there was not a case. They had been having cases from the first week of March. They were turned out on the 18th of March, and, in that small village, in the first week, they had 28 cases, and in the second week of March they had 35 cases. 250 families were put into what we called the new Kalankot camp—250 families with 859 people. After they were turned out there were 19 attacks during the first 8 days of the incubation period. After this the disease completely disappeared.

11,146. There were no further cases?—There were no further cases.

11,147. It was very successful?—It was very successful, but not so successful as in subsequent evacuations, when our measures had improved. I must tell you that the Kalankot people were not disinfected when they were put into this village, but they were disinfected on their return. We had then advanced a step and when we came to put them back we disinfected them all.

11,148. Still, although they were not disinfected when they left, it was successful, there were only 19 cases?—Yes. When we disinfected people before we put them into the camp the result was even more successful.

11,149. Then apparently by the middle of March you made a rule that even the inhabitants of the neighbouring houses should be taken to segregation camps?—Yes.

11,150. Was this rule also extended to the Trans-Lyari Quarter at the same time?—Yes.

11,151. At what time were the private hospitals opened to which people could go?—About the middle of March.

11,152. At what date was the Plague Committee appointed?—On the 20th March 1897.

11,153. You were a member of that Committee?—Yes. The first meeting was on the 22nd March.

11,154. Is it your opinion that plague had begun to decline before the appointment of the Committee?—The figures show that.

11,155. Will you give us the figures?—The decrease in the disease, which continued steadily from the week ending the 2nd April, had really commenced before the

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appointment of the Committee. For the week ending March 20th the number of cases fell from 291 to 255, and although in the next week it rose again to 268, it never afterwards rose until it reached on the 18th ultimo the number 2.

11,156. With the appointment of the Plague Committee did you begin house-to-house visitation and search parties?—Yes.

11,157. Were those measures of rigid segregation to which you refer perfected then?—Yes, as far as they could be made perfect.

11,158. Will you describe the measures taken by the Plague Committee?—Among the first measures for which the Plague Committee arranged were the disinfection of clothes of all entering and leaving the segregation camps; the reduction of the segregation camps in number, viz. to 3, and eventually to 2 on this side the Lyari, and to 4 on the other side; the appointment of military guards over them; and the complete isolation of the inhabitants for the period of ten days. The guarding had been commenced before by the police, on whom very little reliance could be placed.

11,159. During the period they were under observation they were not allowed to go back to their houses in the city?—Certainly not, except with a pass granted by the European Officer in charge.

11,160. A very small proportion was allowed to go?—Yes, hardly anyone then.

11,161. Did this arrangement continue during the whole of the first outbreak?—Yes.

11,162. Will you give us an instance in the first epidemic where you disinfected the people before putting them into camp?—Yes. In the case of Gharibabad. We put the people in the same village of huts in which we had put the Kalankot people, as we found that we could not make a village large enough for the whole place; so our plan was to treat them in turns—dealing with Kalankot first, and after them, with another village, and so on. We kept the Kalankot people, 250 families with 859 persons, six weeks out, and then turned out the village of Gharibabad. That was on the 1st and 2nd of May; and then we disinfected them.

11,163. Before you turned them out, were there many cases of plague among them?—At the end of April, when the disease was disappearing from all other villages, Gharibabad was infected most seriously, and the cases were generally of the type of pneumonic plague, known for its spread of infection. Ever since the outbreak there was never so large a number of fresh cases in any week in this village as in the last one in April. There were 12 cases in Gharibabad alone. That was in the last week in April, and we turned them out on the 1st and 2nd of May.

11,164. You disinfected them before you turned them out?—Yes we disinfected them before we turned them out.

11,165. What was the result of that?—There were two cases on the following day, and after that none.

11,166. For how long were they kept out?—That was the last village that we moved into the new Kalankot huts and consequently they were kept out for some time. On the 28th of June they were allowed to come back.

11,167. To their former houses?—Yes, when the plague was over.

11,168. Their former houses had been disinfected?—Every single house had been disinfected. Kalankot was disinfected under Mr. Cadell, whom you met at Bangalore. We put him on in order that it might be most thoroughly done. Every house was stripped, the stuff (*i.e.*, matting of the roof and walls) was burnt, and the floors were dug up and thoroughly disinfected with perchloride.

11,169. Did any case occur in this village?—None, I believe.

11,170. What is the number of people turned out?—In Gharibabad the number of families was 240 and the population was 913.

11,171. Nine hundred and thirteen were turned out?—Yes.

11,172. Have you any other instance in the first epidemic which you would like to refer to?—There was a village of Mekranis turned out in the same way. That village was on this side of the Lyari, but we moved them to the other side. There again they were disinfected. They had plague extremely bad. I was in the village on the day they were taken away. They never had a case after they were turned out.

11,173. How many people were affected on this last occasion?—42 familes and 170 people.

11,174. Were there other similar cases in the first epidemic?—There were other cases. There was one terrible compound. It was near a large tank here in the city. We found the one compound riddled with plague; it was terribly bad.

11,175. It is rather densely populated apparently; a large number of houses were there?—Yes; but all one compound—very crowded, very dirty, and very insanitary indeed. There we ran up huts as hard as we could on the banks of this tank, close to where they were. We did not take them more than a hundred yards; and we disinfected them, and turned them in with most satisfactory results. I think there was one case.

11,176. How many people were turned into these huts from this place?—That was, of course, a much less number—perhaps 150 to 200. I have not got the statistics, but that is about it.

11,177. One case only occurred?—One case only occurred.

11,178. What occurred when they returned to their former habitations?—Their former habitations were levelled to the ground.

11,179. No further cases, therefore, occurred?—No. There were four cases: three deaths on the day previous to their removal, and one afterwards.

11,180. How soon afterwards was that one?—That case was on the day of removal. There were none after that.

11,181. I think we may now go to the next epidemic. When did the second epidemic occur?—The first local case was on the 25th of March 1898. An imported case was found in the Kiamari segregation camp on the morning of the 23rd.

11,182. In the interval had you been entirely free from plague?—Yes.

11,183. You have absolutely no evidence to make you believe that there was any plague?—My opinion is that there were certainly no cases of deaths from plague in the interval. I watched very closely indeed, and by that time we had got a grasp of the mortality. We watched it closely; we had every death or dead body inspected by men who were the very best men we could get to detect plague—men who had great experience. Karachi is not a place where concealment of death would be easy. I think I am right in saying we have never had a case of concealment of death. We have had plenty of cases of concealment of plague, but not of death.

11,184. No cases of burying bodies?—I think I am right in saying no case occurred in Karachi at all.

11,185. Therefore this appeared to be a new epidemic?—Yes. In order to be buried or burnt—for the Muhammadan or the Hindu, respectively—every body on this side the Lyari (which, after all, was the great plague-stricken part) has to be carried for burial across the Lyari, and for burning, a long distance away across the river. They had to cross this great, broad, open river-bed, so that no body can be removed privately, but is necessarily removed in the most public way possible.

11,186. Then you have every reason to know that there were no deaths from plague in the interval?—Yes.

11,187. Were you able to trace the cause of infection in the first case of the second epidemic?—No.

11,188. Or in any of the earliest cases?—No.

11,189. What surmise have you in regard to the subject?—I do not know much about the first case. It occurred in a place by itself. The next known case, and the cases that followed were in a place which is called the Joria Bazar, which consists of several streets.

11,190. Were all the houses in this district during the time of the first epidemic, or immediately subsequently to the first epidemic, disinfected and cleansed?—All the houses in which cases had occurred were disinfected.

11,191. Not all the houses?—Not all the houses. Every house was cleaned and opened out.

11,192. But not disinfected?—No, not disinfected.

11,193. What did the cleansing consist of? — A thorough searching of the house, and a burning of all rubbish, which was turned out in cartloads.

11,194. Were they then whitewashed? — I think practically every house was whitewashed.

11,195. But not actually disinfected?—No, excepting plague-houses.

11,196. Plague again occurred in the same district?—Yes.

11,197. You were not able to trace the origin of the second outbreak?—No, but it occurred in this bazar, where there are lots of retail sellers of grain and other material; and it was marked by the most extraordinary appearance of the rats.

11,198. Will you kindly give us an account of the appearance of the rats?—We found out that there was no doubt whatever that dead rats had been seen a week or two before any case was reported. I learnt afterwards that one or two families—and possibly more than that—had removed to Hyderabad because of dead rats being found. The fact of the dead rats being found had also been mentioned in the native clubs. It was known, but it did not come to the ears of the officials.

11,199. But you know that there were dead rats?—We found that out afterwards. There is not the least doubt that dead rats had been seen for a week or two preceding.

11,200. But you say the natives knew that rats were dying before that time?—They had been seen by the natives a week or two preceding the first cases that occurred in the Joria Bazar.

11,201. In the first epidemic there had been no appearance of rats?—No, not prior to the outbreak or at the commencement of the epidemic.

11,202. This is the first occasion in which dead rats had been seen in numbers?—The first epidemic was not preceded by any appearance of dead rats, but some were afterwards seen; nothing was seen, however, in that epidemic to at all equal the extraordinary sights in the Joria Bazar.

11,203. What were these sights?—I used to go down every morning, and morning after morning you came to the same godown, and perhaps one morning there would be ten dead rats lying on the ground—another morning there would be eleven, and so on, continuously. Although the godown had been swept out and disinfected, yet the very next morning there would be a lot more dead rats on the ground. In the bags full of grain, and other material, you would see the rats popping out of the bags, and running in every direction —scuttling across the street by you. It was the most extraordinary sight I ever saw—rats in all directions.

11,204. Rats in good health as well as plague-stricken?—Yes. I remember going into one little dirty bath-room, and on looking up at the beams, I saw a big rat dying of plague on one of them. Numbers of rats were found afterwards in the houses, and in the godowns. In one house that Lieutenant Anderson took me to see, from which the people had cleared out about six weeks, you really could not take a step without treading on a dead rat.

11,205. In the same district?—Yes, in the same district. There was no other case like it. On the staircase of that house that we went to, on one step there would be two dead rats, on the next step one, and on the next two dead rats, and so on, the whole way up. You could not tread on the floor without treading on a dead rat. It was a most extraordinary sight—they were all dead, and they had been dead for some time.

11,206. At that time, were there dead rats in any other part of the town?—They had been seen in other parts before that. I did not see that house till long after the outbreak.

11,207. Were any of these rats examined pathologically?—Yes, by Dr. Gibson when he came up.

11,208. Dr. Gibson who is now in Bombay?—Yes.

11,209. Have you a report by him? What was the general result?—There has been a good deal of correspondence about the Joria Bazar, and that contains it. He did not come until very long after the outbreak—not for many months.

11,210. Do you know if he found plague bacillus?—No, not from dead rats—mummied rats as we call them —nor in the gunny bags, nor in any materials he took out of the houses.

11,211. Did the second epidemic extend quickly, or did you take immediate measures in this instance when it first appeared?—It extended very quickly indeed; we took measures at once.

11,212. When the second outbreak began, was the same Plague Committee in existence?—Yes; the individual members had changed a little.

11,213. You were a member still?—Yes.

11,214. And General Cooke also?—Yes.

11,215. Did it continue to direct matters in the second outbreak?—Yes.

11,216. And were its methods at the beginning of the second outbreak the same as at the end of the previous outbreak?—Quite the same, but by no means the same as at the commencement of the first outbreak.

11,217. When were they changed?—That, again, has been a gradual change.

11,218. Did you at first evacuate neighbouring as well as infected houses?—Yes, but not always. It was according to the discretion of the Superintendent. At first I do not think we always took the neighbouring houses; but later on we went much further.

11,219. What were the limits of discretion? On what grounds would the Superintendent take the one course or the other?—It depended on many things. It depended partly upon the nature of the houses. Supposing there was a house, with a little street between, and that the next house was remarkably clean and well kept, with good ventilation and so on, in all probability the Superintendent would not move the people in that house. If, on the contrary, a case occurred in the chawls, of which there are a good many (a chawl is an open compound with a row of houses right round), the whole chawl would be turned out. They were generally dirty, ill-ventilated places. At first only houses where individual cases occurred were evacuated; but subsequently all the neighbouring houses were evacuated. We took much larger areas subsequently.

11,220. At first were you successful?—No.

11,221. Plague extended? — Yes; plague was far more rapid than in the first epidemic.

11,222. Your methods were insufficient, and in the second epidemic you adopted the plan of taking a larger number of houses?—Yes.

11,223. Was that any better?—Yes; in parts that was very successful. Take a part like the Sadr Bazar. In the Sadr Bazar in the first epidemic we went largely for evacuation. I do not think it could be said that the epidemic was ever really bad in the Sadr Bazar. We kept it under to a great extent.

11,224. What other parts were affected by the second epidemic?—All parts—practically all over the town.

11,225. There are, of course, houses of superior character in the town, are there not?—Yes.

11,226. Were there plague cases in these better houses?—Sometimes.

11,227. Occasionally? — Occasionally. It was the general idea that the cases could be accounted for.

11,228. By some direct infection?—There was not the faintest doubt that the ill-ventilated houses, where the people were crowded, got the plague far the worst; it was quite apparent.

11,229. Could you give us a slight sketch of the second epidemic? Did it affect a large number of people; and how long did it last?—It has never died out.

11,230. And you do not know how long it may last?—No.

11,231. Have a large number of people been already infected?—A very large number.

11,232. How many?—Up to the 22nd of this month there have been 3,263 cases and 2,552 deaths.

11,233. I see that some orders were issued, and I think they must have been issued while you were Collector, and before you became Commissioner in Sind. An order was made on the 7th April as regards the evacuation of the Joria Bazar?—Yes.

11,234. Can you tell us the terms under which the people in the Joria Bazar were told to leave it, and what were they told to do when they had left it?—They were not, owing to the great haste and some confusion

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regarding orders, under any particular instructions, except those who were segregated from infected houses. The other people were allowed to go where they liked.

11,235. Were all the contacts of the Joria Bazar at that time supposed to be in the segregation camp?—Certainly.

11,236. But the rest of the people were told to leave?—They were allowed to go where they liked. We had a great many plans for making shops for them, but haste in executing the order prevented such a measure.

11,237. Were they not told to go to the Trans-Lyari and Garden District?—I do not think they were; but the Plague Superintendent may have done so.

11,238. Did they get an inkling of the order and go out before they actually got it?—Yes, to a great extent.

11,239. Did they go out of Karachi or move about into other parts of the town?—They could not go outside the cordon.

11,240. Then they were distributed among other parts of the town?—Yes, and in the vicinity. They could get outside into the desert area around, that is, they remained in Karachi or in its vicinity, from 10 to 15 miles, up to the Malir Camp. Our cordon was from the Malir Camp across a narrow neck. All in that area, together with the surrounding villages near the Camp, you may take as being practically Karachi and the vicinity.

11,241. You think they remained between Malir and the sea?—Yes. Within that area they could go where they liked.

11,242. Was there an order made for the evacuation of the city area including the Market Quarter?—That is for the whole city. The actual date of the order was the 7th May 1898.

11,243. Then there was a subsequent one?—There was one on the 16th May for a quadrangular area formed by the Napier, Jail, Bunder, and Lawrence Roads.

11,244. By the time that these orders were issued you had practically issued orders for the evacuation of a very large proportion of the native town?—Yes.

11,245. At the time the last order was issued were all contacts still taken to the segregation camp?—Yes.

11,246. I think you have something to say with regard to the execution of hospital and evacuation measures through tribal Chiefs?—Yes. It is very interesting. I do not suppose it has been done anywhere else. The Trans-Lyari portion of the inhabitants consists of some 30,000 people, mostly poor inhabitants engaged in wool-picking, and wool-washing, fishermen in the Harbour, and coolies, &c. We managed them entirely through the Heads of their tribes and their Mullahs. I have no hesitation in saying that it was much more successful than any management on this side of the river. Of course, it could not have been done on this side, because there are no tribes living together, and therefore no influence of any Headmen. The disease gradually crossed the Lyari on the 10th of January 1897, and on the 3rd of February the Commissioner called in a Muhammadan Deputy Collector, and under him we put Muhammadan doctors and Muhammadan assistants. They got hold of the Chiefs and Headmen, and Mullahs, and worked all the measures through them. We went on in the same way as we learnt experience. We went on gradually from point to point, until on the 19th of March (in the first epidemic) we came to the great measure of removing the sick into hospitals. On the 19th of March 1897 these people themselves removed—without any assistance from the officials at all—86 sick people, ill of plague, to the hospital huts, which we had arranged for them. Instead of the people being dragged from their houses by the officials, they did the thing themselves. They had been worked up through their Chiefs and Mullahs by Sirdar Muhammad Yakub, the Deputy Collector now in Bombay. They fulfilled the promises they had given us. They carried out their sick and put them into huts.

11,247. Has that been done before in Bombay?—I do not suppose it has been done anywhere. From that time, on the whole, they were perfectly faithful to their promises; and they reported every case of sickness. When I say "every case" I mean that they reported practically every case. They behaved most splendidly. They helped us enormously in dealing with the cases here. We naturally burnt down every hut at once. They were all kutcha huts. We cleared the people out all round.

11,248. Will you give us your views with regard to evacuation?—I have already to a great extent given evidence upon evacuation. I could quote lots of opinions of different officers, but they are absolutely unanimous. Evacuation is the one thing. Every officer recognises that evacuation is successful.

11,249. It is the great measure?—Yes. The last measure adopted is that if a case occurs we turn out a considerable block.

11,250. In your opinion if that is done it is very successful?—Yes.

11,251. And you think that plague will inevitably die out at once?—Provided that you could really remove all the people. If you could remove all Karachi right away into clean ground, I believe plague would die out. This brings me to what we call our "voluntary camp" system, which is the second point upon which I proposed to give evidence.

11,252. Were there not a large number of cases in the voluntary camps in May 1898?—Those people had gone without any information from us at all; they had gone on their own initiative.

11,253. Can you tell us when this voluntary system of permitting people to go into camp across the Lyari, taking the sick and contacts with them, began?—The general permission was very much later, a long time afterwards. I was no longer Collector when the general permission was given.

11,254. Was there any plague among the people who formed the voluntary camps before they went out?—Yes.

11,255. Then how were they permitted to go into voluntary camps with their sick?—They did it secretly.

11,256. Then the original evacuation of those quarters of the town and the people going voluntarily into the Trans-Lyari camp, taking their sick with them, was unauthorised?—Certainly.

11,257. But since that it has been authorised?—Yes, a long time after that.

11,258. Can you tell us when it was authorised?—I am afraid I cannot without looking up the point. The arrangements in Karachi were unique. In this second outbreak of plague the people, to a very large extent, went out and built their own camps in the desert area beyond the Lyari on the east, and on the west beyond the northern branch of that river. Karachi is surrounded practically by a desert, and therefore the facilities of dealing with the people are good. The people went out and built camps all over the place—what we call the "voluntary camps." In some of these camps they had their own Plague Committee. The Committee inspected the houses night and morning. They had their sick sheds at a very short distance from the camps, but apparently at quite a sufficient distance. The results in almost every case were excellent. The best camp of the whole was the Brahman camp. In that camp what they called their Plague Committee inspected every hut every night and every morning. The consequence was that plague died out in nearly all these camps. We were very busy, and were not able to control the people when they first went out. We really hardly knew what they were doing; we were far too busy with our own measures in the city. Consequently they went out and erected their huts much too near together. That was in the portion of the voluntary camp under Dr. Seymour, who will give evidence before you. In that part, some of the villages were much too huddled together, and plague did linger a little. We divided this voluntary camp system into two areas, one under Dr. Seymour and one under Sirdar Muhammad Yakub. On one side, under Dr. Seymour, there were 12,319 people; whilst in the other area, under Sirdar Muhammad Yakub, there were 11,241.

11,259. How long had these camps been in existence?—Several months.

11,260. Without a change in the population—the same people?—Practically the same people. Roughly speaking, you may say that 25,000 people went out. There were small camps besides, but you may say that 25,000 people were out.

11,261. Hindus and Muhammadans?—Yes.

11,262. Separate camps?—Yes; separate camps for different classes of people.

11,263. I understand you had very little plague in the camps?—Yes; in some we had none, where they were well constructed. Where they were huddled together, as a few of Dr. Seymour's camps were, there were a few cases of plague. Dr. Seymour can give you an exact description of it. Still, it is wonderful how the removal to what I may call the desert put a stop to the plague. There is no doubt about it whatever.

11,264. Do you still hold the view which you held when you wrote your memorandum to the Bombay Government, that the people to be removed must be all medically examined, sick and suspected persons being separated and isolated, and that, if possible, communication with infected areas should be stopped?—No, I do not, entirely. In Karachi—I should not like to lay it down for other places—it is very much better to let the people go out of themselves. They are very willing to go; let them go by all means. Let them carry their sick with them, they are much less dangerous to Karachi and dangerous to themselves when they get out into the desert area outside, and it is very much easier to carry out the measure if you let them carry it out voluntarily themselves.

11,265. Does your subsequent experience show you that it is better to let people go out of themselves?—Yes, very much better in Karachi, or in places where it is feasible.

11,266. What is your view about the disinfection of houses?—The disinfection of houses costs an enormous amount, and I do not believe that in the city it is worth the expense. I have a great many cases here, and I can give you instances where people, after very careful disinfection of their houses, went back and got plague again. I have cases here (which I shall be very glad to hand in) from two of the Superintendents—Mr. Vaughan, a Bombay Civilian, and Mr. Brunton, now Secretary of the Karachi Munipality. Mr. Brunton was one of our Plague Superintendents, and was a very careful officer indeed. He has given a list of plague cases in the Garden and Soldier Bazar Quarters, in the epidemic of 1896–97. One case is as follows: "A "case of plague occurred in a room of the servant's "quarters of the bungalow, situated on plot No. 6, "1–5, Garden Quarter, on the 27th March 1896. The "room was a corner one of a range of rooms, and it "and the adjoining room were disinfected and white-"washed. The room was empty until after the 15th April, "when a mali went to live in it. On the 18th of April "this man was removed to the hospital suffering from "plague. The whole range of rooms was then care-"fully disinfected, and the roof entirely removed and "burnt, permitting the sun to pour in, the burnt walls "and the beams of the roof alone being left standing. "The place was empty for three weeks from the date "of the last case. On the 14th of May a man was found "lying ill with plague on a bed just outside the room. "Over the top walls at one corner of the room, the man "had placed a piece of matting to protect himself from "the sun, and he had made a fireplace in the corner, "and used to cook his food there. It was alleged he "never slept in the room, but merely used it as a "cooking place, and he had done this for two or three "days only."

11,267. Is it exactly known whether either of these men could have come into contact with plague cases otherwise?—It is quite impossible to say.

11,268. Have you any other cases?—I have four from Mr. Brunton, and I have several from Mr. Vaughan. I cannot myself give you a case, I can only give you my experience. I was out pretty nearly every day, and one kept on coming across cases of people going back and getting plague. Mr. Vaughan gave some very striking cases.

11,269. Have you such a case as this: is there any case of a person having gone to a disinfected house who for 10 days previously could not have been in contact with plague?—It is impossible to say.

11,270. You have no cases?—Yes, I think I can give you a case. I think Mr. Vaughan gives a case from the segregation camp.

11,271. We should like to hear the particulars of a case of that kind?—Mr. Vaughan in notes made by him on the re-occupation of disinfected houses says: "Shortly "after taking charge of the Napier Quarter as Plague "Superintendent, I was told that a family who had "been segregated on account of a case wished to return "to their house, in Jumo Sonaro Street. I went to the "house, and found the family sitting outside it, their "clothes were still dripping from the disinfection bath "they had received on being discharged from the "segregation camp, so they had evidently come straight "from it. The house was marked as disinfected by "my predecessor, and had been done by a gang "working under Superintendent Jan Mahomed, Opium "Head Constable, who had had similar work in the "previous epidemic. I allowed the people to re-occupy "their house. Some five or six days later it was "reported that there was a person dead of plague in "the house. I went there and found one man dead, "clearly from plague, with a bubo, one woman, and "two little girls also, were lying on the ground, and "all proved to be suffering from plague. The sick "were removed to the hospital, and with them, as "attendants, the remaining inmates of the house; one "of the latter, I believe, developed plague there. As "far as my recollection goes the number of persons "who re-occupied the house was 7." The striking fact in that is that people came straight from the segregation camps back to their houses.

11,272. These cases of plague were among the people who had come from the segregation camp?—Yes.

11,273. Do you know how that house was disinfected?—It is quite impossible to say that any one single house in Karachi was thoroughly disinfected. Do not misunderstand me. We know very well that the disinfection, especially in the second epidemic, was very thoroughly done indeed, because it was done under European doctors. English doctors were sent out, and we put one of them in charge of a certain number of houses. They looked after the work very thoroughly, but even then—given European supervision—it would be quite impossible to say that someone in the room may not have been careless. But that very thorough work was done at very large expense, especially in the second epidemic, is a fact. I do not myself think it was justified.

11,274. Of course these people had not been confined to their houses after returning?—No, they were not confined to their houses.

11,275. There was plague in the town elsewhere, in other parts of the town?—It is difficult for me to say. I have not the dates. I should imagine that there was not very much plague when they went back.

11,276. I think you had better give us the rest of the cases?—To continue Mr. Vaughan's notes on plague cases in the Garden and Soldier Bazar Quarters in the epidemic of 1896–87, he says a case of plague occurred in a small house occupied by a Fakir on plot No. 6, 1–4, Garden Quarter, on 5th April. The roof of the house consisting of matting was removed and burnt. The walls being of mud were left standing. The walls and floor were disinfected. On the 20th April the inmates who had been in segregation were allowed to return to the house, which was then re-roofed with new mats. On the 24th a second case of plague was removed from the house. Again, in another case, "At the end of "March, a case of plague occurred in a house in plot "No. 243, H–6, Soldiers' Bazar. The house—which "is single-storeyed and of stone—was disinfected and "unroofed. It remained empty until about the 23rd "of April when it was occupied by a prostitute, the "roof put on being a temporary one of matting. Four "days later, she was reported ill, and on examination "she was found to be suffering from plague." Another case he states as follows:—"A case of plague occurred "in a house on plot No. 168, H. 6, Soldiers' Bazar in "March 1897. This house is used as a shop. It was "disinfected, and all grain &c. found therein was "destroyed. The shop remained closed until the end "of April, when it was opened. On the 3rd of May, "the man who had opened it and was living on the "premises, was seized with plague." Again, he says "A child died of plague among a family of Khatri "Musalmans, and the family was segregated. The house "was disinfected with perchloride of mercury, under "my own supervision. The owner was a wealthy man "and had a large shop and rooms full of cloth for "dyeing and dyed clothes. All these unused articles "were exposed for three days on the roof. The "disinfection of this house lasted for more than two "days, and was, I think, done as thoroughly as such a "place could be. It was a large and not ill-ventilated "building. When the family returned from segregation, "I advised them (not believing much in disinfection

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" of houses myself) to go and camp out across the " Lyari. They said they would have gladly done so, " but that the eldest son (who was crippled and an " idiot—an epileptic, I believe) would die away from " his usual surroundings (I believe that the real " reason was that they had a large sum of money on " the premises), and I reluctantly allowed them to " re-occupy the house. About a week later, another " child of the family was reported dead, and was found " to have died of plague. After this, I allowed no " re-occupation." A case is also reported among the Mongwars, a very poor, dirty class. "Two Mengwars " walked into the Vishandas Hospital, suffering from " plague. I ascertained that they came from a gali off " Ali Aklun street. On going there I found the " families preparing to decamp. It appeared that " there had been a case there before my taking over " charge, and that the people had slipped back without " giving notice after being discharged from segrega- " tion, and by keeping the outer door carefully closed " had avoided detection. They did not live in a house, " but in a courtyard under sheds, very open. The " place was marked as having been disinfected by my " predecessor. These latter cases occurred at least a " month, if I remember aright, after the original one, " and had not, I believe, been caused by living in the " same house, as about this time the plague was very " rife in the Mengwar community generally, and most " probably they came in contact with it in some other " infected family."

11,277. Have you had any experience of inoculation?—I have only a general impression of its effects. Dr. Kaka will speak about that. I can only say that my idea is that it is beneficial.

11,278. What do you consider to be the chief mode of dissemination of the plague?—Rats first; clothes, certainly; and something in the retail grain shops, the nature of which is uncertain. I do not for a moment say that the grain gives the infection, but the Banniahs' shops, where the grain is sold, and the flour mills, are dangerous places. That infection is spread by these grain sellers, I think there is no doubt about at all. It kept on recurring among them.

11,279. Apart from being spread by rats?—Yes, apart from being spread by rats. But, of course, the rats naturally went to the grain shops; their dead bodies were found among the grain bags. One cannot say more.

11,280. Both rats and human beings appear to have acquired plague from these grain shops?—Yes, I think so.

11,281. What do you think the virulence and extension of the disease is chiefly dependent upon?—Dirt and overcrowding, and want of ventilation. I should put want of ventilation even before dirt.

11,282. You would put want of ventilation first?—Yes.

11,283. I believe you had corpse inspection?—Yes.

11,284. What do you think about its efficacy?—I was strongly in favour of it; and if plague were to begin afresh in a town where they had never had it before, I think it would be very valuable; but in Karachi itself now, I think our system of supervision of mortality is too close to render the inspection necessary; and, of course, it is very disagreeable to the people, although the people of Sind are much easier to deal with than people in most parts of India. We did not meet with violent opposition, and the people behaved extremely well. But there are many classes to whom it is no doubt repugnant to their feelings.

11,285. Do you think it is unnecessary?—I think it is unnecessary provided the mortality is watched in the most careful way possible. There cannot be plague for more than a few days without there being two cases in a house. If there are two deaths in a house, then you know at once that there is something very wrong. We can always have corpse inspection then. You can insist upon corpse inspection where there is suspicion, but I do not think that it is necessary now. Of course, at first we were very uncertain as to our statistics. Now, I think, we do really know what each death is occasioned by.

11,286. Do you have your mortality returns fairly accurately made?—I believe so. Again I repeat that Karachi is a singularly easy place to deal with.

11,287. How is this return made? What is your organisation?—During the plague it entirely depends upon the Plague Superintendent. We take it out of the hands of the ordinary Registrar of Deaths. The first duty of the Plague Superintendent, on going to his charge in the morning, was to make up the death return.

11,288. How does he do that?—Through the reports sent to him, and through the subordinates working under him. Everybody had to report death immediately—every private person.

11,289. What is the penalty?—Ordinary fine. But they all did it. Throughout the second epidemic all deaths were reported at once. Burial and burning were also prohibited without a certificate that death had been reported, and for that purpose police were stationed at the burial and burning grounds.

11,290. What is your actual official organisation for ensuring sufficiently accurate death returns?—I think I had better leave that to Dr. McCloghry, who is acting as Deputy Sanitary Commissioner, and to Dr. Kaka. We have Registration Offices, at which people have to report within a certain time.

11,291. Generally speaking, in this question of organisation, what is the difference between the ordinary period and the plague period?—Plague is immediate. The old rule was in a couple of days; but we are introducing immediate, the moment the disease breaks out. All Municipalities are adopting the rule that it should become immediate, even in the ordinary registration offices.

11,292. Did you take any steps to prevent plague extending from Karachi to other districts?—Yes.

11,293. What were those steps?—The great steps was the Malir camp, the second station out from Karachi on the railway. There, again, Karachi is singularly well situated for these measures. On one side is the sea, to the north is the desert — desert hills. On the West, is the State of Las Bela, which is part of Beluchistan, and desert. The people were kept out there by the State Authorities; but, as a matter of fact, plague would die out immediately. It could not live in the barren hills on the west side of Karachi. There are no villages for it to get hold of; there are only a few huts. Our experience is that, if plague-infected things are left outside in the sun and air, plague dies out immediately. To the best of our knowledge, not a single case went into the Las Bela State.

11,294. How long would it take to go across the desert to some inhabited place?—There is the capital town, Las, which is 60 or 70 miles away.

11,295. How many days would it take?—Two or three days.

11,296. Then it would not be impossible, would it?—Even that is only a little village. The country consists of bare rocks, all practically desert.

11,297. How far would it be, in days' journeys, to any important inhabited place?—There is the sea on one side, and there is the desert on the other. The creeks come round to a great extent, and practically leave a small channel, through which the railway runs. At this place we had the Malir camp on the railway. We took out the people coming by train, and those who went by road along here—what I call a narrow channel—were stopped by a cordon of police; so that, really and truly, it was comparatively easy to shut Karachi in.

11,298. In fact, it is the only possible way—going through the desert here?—Yes.

11,299. Is there any important place within 10 days' journey through the desert?—By the desert there is no important place at all.

11,300. But did the plague extend through the town and city of Karachi to neighbouring places?—Yes, it extended through this narrow channel to Tatta. That was probably by the railway.

11,301. Was that the only village or town infected?—There were a lot of little villages infected in the first outbreak, and a few in the second. The nearest place of any importance in the first outbreak was Tatta, which has 8,000 or 9,000 inhabitants.

11,302. On the whole, the escape of plague from Karachi was very small?—In the second outbreak you may practically say that it was limited to Karachi and the outskirts. In the second outbreak it did not go to any town in Sind.

11,303. That was due to the precautionary measures in the second outbreak differing from those you took in the first?—Yes; in the first outbreak of plague in Sind our first measures undoubtedly were to get the people away. Our great idea was to turn the people out of the town as fast as we could in every direction. We sent them off everywhere—by railway, by sea—to Cutch—all over the place. We scattered the people as much as ever we could at the beginning—while we thought it was safe to do so—in order that they might not catch the plague. On the second occasion, however, we kept them in.

11,304. (*Mr. Hewett.*) Did you have any villages in the Karachi district affected in the first outbreak?—Yes.

11,305. Did you evacuate them?—You could hardly call them villages, they consisted of only a few huts. Sometimes we burnt the huts down. I do not think there was any regular system of evacuation.

11,306. In the interval between the stoppage of the plague in 1897 and its outbreak in 1898, was the mortality here normal?—I think it was quite normal. Perhaps it might have varied in one of the fever months from the actual average, but practically it was normal. The mortality goes up very much in the fever months every year; sometimes it is one month and sometimes another, but from September to January, I think, you may say that you always have a larger mortality.

11,307. 1897 was a year of inundation, was it not? The river was rather high?—Yes. Fever was very bad in Sind.

11,308. You say that the mortality from rats in the Joria Bazaar took place before any cases of plague in the Joria Bazaar, but not before that other case on the 25th of March?—I should think probably before that.

11,309. Have you any proof that it was before that?—No, none; but for a week or two before—it might be two or three weeks—dead rats had undoubtedly been seen.

11,310. Do you feel certain that you got the first case of plague in the case of the 25th March?—I cannot say we are absolutely certain, but I certainly think so.

11,311. Your measures were more complete in the second outbreak than in the first; to what do you attribute the relatively larger number of attacks and deaths during one period of the outbreak in the month of May?—To the rats, undoubtedly. I will tell you one thing which may possibly have had an effect. We did a very stupid thing in the first outbreak, I think. We thought that cats got the plague. Cats were said to have been found with buboes, and we killed an enormous number of cats, certainly thousands, and I am afraid we did a great deal of harm in that way. I may tell you that the cats in Karachi were a most astonishing sight. I should never have believed it if anyone had told me. The little narrow lanes were simply chock full of most meagre, wretched, insanitary cats, as we thought them.

11,312. Were any of these cats examined bacteriologically?—I do not know that they were. We had not the appliances then for examination.

11,313. Then I understand you to account for the greater violence of the second outbreak by the fact that rats were taking plague about inside the town?—Yes. As it spread from the Market Quarter to the Old Town and Machi Miani Quarters, dead rats were found in advance. Almost always dead rats were found before the plague appeared. The Superintendents themselves generally saw rats before they had cases.

11,314. I am not quite certain that you have given us all the instances you would like to have given of the good effects of evacuation in the first outbreak?—There were other cases, there is no doubt. On page 44 of Muhammad Yakub's report on the first epidemic* he gives instances of other camps. He says:—

"In the first week of March, the infection having rooted itself badly in some of the villages, the Commissioner in Sind desired to remove the people, as far as possible, to camps on such healthy spots as could be watched properly. Accordingly, small advances were first offered of Rs. 3 to each family, and they were enabled to go and settle at specified spots across the larger branch of the Lyari, but within the limits of the Lyari Quarter; and suitable conditions were made to provide against over-crowding, &c. In the second week of March 242 families were removed out by means of the advance. The emigration having started once, others followed the example; the advance was withheld and mere passes were issued, giving permission to settle at the selected places. In this manner, before the end of March there were three settlements at Amli Talao, at a distance of three miles from the city, comprising 128 families and 512 souls, and two settlements at a place called Morro, a mile nearer, consisting of 182 families and 699 souls; besides these, two other settlements were formed at Shershah, half-a-mile still nearer, comprising 368 families and 1,599 souls. The people made their own temporary sheds to live in. A temporary sick camp and a segregation camp were made at Shershah. Two supervisors were especially employed to hold charge of these camps, and Chief Supervisor Azam Pir Mahomed Khan also worked there. The spots were healthy; good drinking water was got from kutcha wells or from the tank. The people went daily to their work to the city or to the harbour, crossing the sandy beds of the two branches of the river, but they were always found satisfied with their temporary residence. The Amli Talao people occupied a sloping rocky ground close to a large bunded tank holding rain-water. They lived at this beautiful spot for more than two months, and on the 19th May, when the villages were practically free from the disease, were allowed to return to their houses under the sanction of the Plague Committee, and were disinfected with kit and clothes, which was done in the dry bed of the tank in my presence, and under the supervision of Dr. Cornwall. The President of the Plague Committee visited the scene of disinfection on this occasion. During this period of more than two months two cases and two deaths only occurred, which happened in the first week, after the families affected settled there, *i.e.*, within the incubation period. Save this, it is a pity that the limited supply of water in the tank had not permitted more people to be sent to the place. The two camps at Morro were also on rocky ground, and consisted of 699 souls, who lived in the camps for upwards of two months, up to the 20th May, on which date the people and kit were in like manner disinfected at their kutcha wells, and then they were sent back to their houses. These camps enjoyed perfect freedom from the disease throughout their stay, except that on the 17th April one case of plague occurred, and the patient, who was working as a labourer in the infected quarters of the town, had brought the infection from there. Here, too, had there been more water, I should have sent a larger number of people to camp there."

There was a very curious case in one of the dhobi ghats, a compound for dhobis, with huts all round, and big reservoirs for washing in the middle. I got information one afternoon that there were three or four cases of plague in this dhobi ghat, and we thought that was a very serious thing, because they were washing vast quantities of clothes for the townspeople. I put a police guard over the place at once, and went down the next morning, and we removed five cases to our big segregation camp. We then put the whole of the clothes into the reservoirs and disinfected them; all the dhobis' houses were also very thoroughly disinfected. They had two or three cases in the segregation camp. There were about 70 dhobis. They came back after the 10 days, and they never had a case after that. It was rather a remarkable instance, and I thought perhaps it might be interesting.

11,315. In the second outbreak your measures, I understand, were very successful in the Sadr Bazar; have you any instances that you would like to give of the effect of evacuating portions of the Sadr Bazar?—I do not think I can give you instances. The general effect was this. It got among the dhobis, for instance; if we removed the dhobis in a block and took them outside, we had no more cases in the surrounding part. Generally speaking, when we took out a large block the result was that in that part it was stopped, but it was not always so. For instance, we would perhaps take one house too little. There was a very curious case which occurred at the end of this epidemic where we turned out a block, and just took one house too little, and the next case was in the adjoining house.

11,316. How many days after your evacuation was that?—About the ordinary period—within the 10 days.

11,317. Have you any figures which you would like to put before us?—No.

11,318. Can you tell us the greatest number you had evacuated at one particular time there?—We had about

* Not published with the Proceedings of the Commission.

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25,000, and you might add a couple of thousand for the segregation camp.

11,319. That is to say, 27,000 people in camp?—Yes, and we had what we call health camps besides.

11,320. Can you give a rough estimate of the aggregate you had at any one time?—I should think, if you include all the health camps, about 30,000.

11,321. Did you find any difficulty in preventing these 30,000 people of the different camps from getting back into the city?—We allowed them to go back.

11,322. Was there not a danger that they would be reinfected?—There is a certain amount of danger.

11,323. There was no attempt made to keep the people in the camps where they had gone?—No, except the segregation camps.

11,324. These 25,000 people in the voluntary camps were free to come and go as they liked?—Yes; of course, what really happened was that the business men went, and the women and children did not go, as a rule.

11,325. Was not there a danger of their conveying infection back into the camps?—The going backwards and forwards, I think, is absolutely safe. I do not think that is likely to give infection. Sometimes, if they squatted right in their shops they did get it again, but not unless the contact, if I may call it so, with the shop was very close. As a rule, I think the danger was not very great, but, on the contrary, was very little. If you look at the results of the camps, they show it was very little.

11,326. How many people have you in camp now?—Very few.

11,327. Have you plague in any other part of Sind now except Karachi?—No.

11,328. When you say that one of the modes of dissemination seems to be through clothes, have you any instance of plague being taken from one place to another by clothes without human contact?—Yes, when clothes were sent by post.

11,329. Do you mean that you can give any instances in which infection must have been conveyed by means of clothes, and could not have been conveyed by human beings?—No.

11,330. So that human beings may have conveyed the plague in each instance?—Yes. We had very curious cases from Cutch in the first epidemic. The notes which I have here are very brief. The segregation camp at that time for the people coming in by sea was at Manora. In all the Manora cases infection was traced to Cutch, where the people came a month previously, and were detained and disinfected, raising the suspicion that they must have managed to retain some clothes undetected.

11,331. These people had come from Cutch Mandvi a month before?—Yes.

11,332. Was Karachi then plague-infected?—Karachi was, but Manora was not. Manora is separated by the harbour, and these people lived on a spit of land.

11,333. They were not likely to have gone to Karachi?—Not in the least. They were not permitted to go. In the four quarters adjoining the city one case only occurred in a Borah's house, and inquiry showed that clothes had been conveyed from a house in the Sadr Bazar, and had been infected. That was a very curious case. This is from one of my weekly reports of June 1897, when the plague in the city was at an end. The case in the Market Quarter was local, and no satisfactory origin of it could be traced. The house was occupied by three families of Cutchis, of whom one had returned from Rajkot six weeks previously. The other two had gone to the Punjab owing to two deaths of plague having occurred in the house early in January. So that it would appear to be a question whether the infection remained in this house or came from Cutch six weeks ago. That it does not linger some weeks in fabrics is, I believe, the latest scientific opinion on the subject. The case in the Market Quarter was that of a woman who was under observation at Kiamari. On her return from Cutch Mandvi she was allowed to occupy her house on the 6th of June, her husband and two relatives having died of plague at Mandvi two months ago.

11,334. Is there very much communication between this place and Cutch Mandvi?—By steamer and boat.

11,335. Do you think plague went from here to Cutch Mandvi?—I should think it was probable.

11,336. You say that you believe in the efficacy of cordons round small towns, that is, I understand, not cordons to keep people from going into the infected area of the town, but to keep them from going about the country?—Yes, without passes.

11,337. Do you know how many people were employed on the cordons at Kotri?—Mr. Brayson would be able to give you that information.

11,338. (*Mr. Ruffer.*) Do you think the plague came to Karachi by sea?—I think it is almost certain.

11,339. You say that the first bad epidemic of plague was in the grain shops in that quarter of the town?—In the second epidemic, yes, except the one case near the jail.

11,340. Is that anywhere near the Harbour?—No.

11,341. Where is the Harbour?—The Harbour is at least two miles from there; I do not know exactly what the distance is, but it is an immense distance divided by a long bridge of piers.

11,342. Do these grain merchants here have much communication with ships? Does their grain come by sea?—Yes.

11,343. Then they would have frequent communication with ships?—The goods are mostly landed by other people; they do not go near the ships; they might go near the native vessels.

11,344. The native boats coming from the ships would come close to that quarter?—Not far off. They go to what is called the Native Jetty, which is perhaps half a mile away.

11,345. Were there any quarters in the town and district which remained non-infected during the second epidemic?—There was scarcely a case in the Civil Station. There were one or two I think.

11,346. Are there any rats in that quarter?—Yes.

11,347. A good many?—Some of the houses have them; my own house has some.

11,348. Do you think the rats get the plague from one another?—I have no idea.

11,349. How do you account for the rats in that quarter not getting the plague?—These houses were all scattered. I do not believe in the plague jumping at all.

11,350. Did the rats in that quarter get the plague?—Not that we know of.

11,351. How do you account for their not getting it?—Because they are so isolated.

11,352. But they are in communication?—No, they are very scattered indeed. Government House has a large open maidan in front.

11,353. How far did mortality among rats extend here?—It was in the Joria Bazar and Grain Market, and in the Sadr Bazar.

11,354. If the rats catch the plague from one another, how is it they did not spread further in, for instance, in the Civil Lines Quarter?—Because of the large space between.

11,355. Does not that rather point to the rats getting plague from infected clothing, or that they are infected from some other source?—It might be so; it is very likely; I have no idea.

11,356. What are the measures which are being taken now as to the death returns? Is there any corpse inspection going on now?—I believe it is, but Mr. Sladen will tell you exactly. We have had some correspondence about it, and I think it has not been stopped. We had contemplated stopping it, but I am not quite sure whether it has been stopped or not. Certainly, to an extent, it has, because we take doctors' certificates, but Mr. Sladen will explain to you exactly what has happened.

11,357. (*Mr. Cumine.*) Of what caste are the majority of people who live in the Joria Bazaar?—Banniahs.

11,358. Would there be Marwaris there too?—Very few; there are some.

11,359. Are Banniahs the class which have been so much affected in Bombay by plague?—I do not know that. A curious thing about the first few cases of plague was this. The people do not always live in the shops in the Joria Bazar, and have their houses separately, and the first few cases were among the men who sold their goods in the shops, and the women who

lived in the dwelling-houses did not get it. That seems to distinctly connect the beginning with the shops.

11,360. What set of people in Karachi would be most likely to go to Bombay, or receive visitors from Bombay—the Banniahs?—The Banniahs, the Memons, and the Khojas—Musalmans to a large extent; the latter are all under H. H. Aga Khan. I should think every caste in the city also which was in business as shop-keepers.

11,361. Not Banniahs more than other people?—In connexion with the actual material, goods sold in their shops, yes, but with regard to themselves personally, no.

11,362. Now supposing that the first case of plague was a Banniah, it would be natural that the majority of the successive cases would be Banniahs at first if they lived close together?—Yes.

11,363. How are bags carried up from the bandar to the Banniahs' shops?—Very often they would go to the godown of bigger merchants, when they would be carried on carts.

11,364. I mean by which men; by the men of the boats which come from Bombay?—No, by coolies, a quite distinct set of people.

11,365. I suppose the Municipality has a map of the town on which you could enter the deaths that occurred during the two months preceding the discovery of the first case in the second epidemic, so that we might see whether they occurred in clusters or not?—Dr. Kaka would prepare that, I have no doubt.

11,366. Even supposing that the system of corpse inspection would have detected any case of a man who had come from Bombay with plague, and had died, you had no means of detecting the case of a man who came with plague from Bombay and recovered?—No. One of the reasons why I think corpse inspection is not necessary, is that after death plague cannot be detected, and therefore it is possible that a man might have died from plague and not been detected. After death our experience is that plague cannot always be diagnosed.

11,367. Do you remember the date on which the last case occurred at Kotri?—On the 28th January 1898.

11,368. Who would be responsible for the preparation of the disinfectant used in Karachi?—Dr. Kaka, during the greater portion of the time.

11,369. Of what are the floors of the ordinary huts in Karachi composed?—Chiefly mud and cow-dung.

11,370. Did you try house-to-house visitation during the first epidemic?—Yes.

11,371. Do you think that good results followed from that?—Yes, I think so.

11,372. You did not find it scattered the people?—Over the Lyari it was very useful. Of course, without a military cordon it was utterly mischievous in the town itself, because it scattered the people all over the place. In many cases, however, they got no information, and then of course they could not scatter.

11,373. Did the shop-keepers who went out to the voluntary camps transfer their shops there, or keep their shops going in the town?—They transferred their shops in a few cases to the camps, but not so generally.

11,374. You did not attempt any roll-call or anything of that sort in the voluntary camps?—No; there was a great number of those camps.

11,375. Which are the measures of the usefulness of which the people are so convinced that they will carry them out themselves?—Evacuation.

11,376. Evacuation is one. Is abstaining from connexion with the infected village site another?—As much as possible, but of course these poor Banniahs will go back to their business; you cannot very well move them away from that. I think that they have got a very good idea that they must keep out of their houses. They do keep out, and they fly off when plague comes near.

11,377. Would they isolate their own sick?—Yes.

11,378. Do they understand the advantage of that?—They certainly do. In some of the voluntary camps it was very well done, and in some it was very badly done, but they all recognised the value of it.

11,379. What is the present attitude of the people—a helpful one or not?—I think, on the whole, a helpful one. I do not think they like having their clothes burnt. They stick to their clothes, and each individual hopes that his particular case will not spread the plague. Our experience certainly is, that after the houses have been left for a time, which we put at two months, anyone may go into the house with impunity, and there is no fear of getting the plague.

11,380. (*The President.*) Without disinfection of the houses with chemicals?—Certainly. If you thoroughly open a house up, and leave it alone for a couple of months, my opinion, which is founded on a certain amount of experience, is that people may go in with impunity.

11,381. I think you said you would prefer someone else to give us information as to how you learned of existing cases of plague—what the organisation is?—Mr. Brayson was a Plague Superintendent, and he will tell you, although I know it pretty well myself, but I would rather you should have the information exact. I should like to say the people did help us a great deal. Some of the leading people helped us considerably in the last epidemic, and they do help us. On the whole I think the people have been very patient, and behaved very well in Karachi.

(Witness withdrew.)

Lieut.-Colonel W. McCLOGHRY, I.M.S., called and examined.

Lieut.-Col. W. McCloghry, I.M.S.

11,382. (*The President.*) You are in the Indian Medical Service and the Civil Surgeon of Karachi?—Yes.

11,383. What are your medical qualifications?—F.R.C.S.I. and L.K. and Q.C.P. (Ireland).

11,384. (*Dr. Ruffer.*) I believe you have been Civil Surgeon during the two epidemics of plague in Karachi?—Not during the whole of the time. I came on the 13th March 1897.

11,385. Then you have no experience as to the measures regarding death registration before the epidemic?—Not before the epidemic of 1898.

11,386. Can you tell us what are the measures which are being taken now as to death registration, corpse inspection, and so on?—There are certain Plague Superintendents to whom reports of death are made at once.

11,387. All the deaths?—Yes. Certain certificates are taken by Plague Superintendents. Certificates are taken from a medical practitioner who has attended the patient in his last illness. A certificate for children under two years of age is taken from the Municipal Commissioners.

11,388. Are they qualified men?—No. In case there is no death certificate forthcoming, the body is seen, and the cause of death is inquired into. That is the present system.

11,389. What is the number of certificates sent in by medical men? A large proportion?—At present, yes.

11,390. Do you think these medical men really do see the cases alive?—I am certain they see the cases while they are alive.

11,391. Do you think corpse inspection in the other cases is a useful measure?—I think in a great number of cases it is useless. In cases where the bubo is not pronounced, and in puerperal cases, I think corpse inspection is useless.

11,392. Why in puerperal cases?—Because death occurs frequently before the full development of the bubo.

11,393. Do you think you could tell a case of plague pneumonia by corpse inspection?—No, one certainly could not.

11,394. Do you think you see all the cases, or that some of them may be done away with without having been seen?—I am absolutely certain that all the corpses are seen when a certificate is not forthcoming.

11,395. Has there been a large death-rate between the two epidemics in Karachi?—Nothing very unusual.

11,396. You say in your précis of evidence that you think this is due to heavy rainfall of two successive years?—Yes.

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11,397. Could you give us instances where the mortality has been as high in previous years?—Yes.

11,398. In the first place, what was the mortality during the last two years?—I have got them by months. The death-rate of Karachi for the period between the two epidemics of plague is shown below compared with the same periods in the three previous years, and also with the death-rate of three other towns in Lower Sind during seven months:—

		1895-96.	1896-97.	1897-98.
Karachi	September	30·43	33·39	33·02
	October	32·90	34·77	32·74
	November	30·31	35·99	40·82
	December	48·61	59·62*	47·87
	January	52·35	152·69*	42·92
	February	40·08	158·34*	38·70
	March	53·93	133·64*	34·64
Hyderabad	September	—	—	34·96
	October	—	—	33·64
	November	—	—	39·58
	December	—	—	41·56
	January	—	—	27·93
	February	—	—	24·63
	March	—	—	30·78
Sehwan	September	—	—	33·74
	October	—	—	41·52
	November	—	—	36·33
	December	—	—	93·42
	January	—	—	83·04
	February	—	—	46·71
	March	—	—	44·12
Tatta	September	—	—	28·01
	October	—	—	29·43
	November	—	—	30·77
	December	—	—	54·86
	January	—	—	64·22
	February	—	—	48·17
	March	—	—	37·46

* The figures for part of December 1896, and for January, February, and March 1897, include plague cases.

11,399. Would you think the increased mortality in 1896 can possibly be due to plague?—I think it cannot be due to plague.

11,400. Did you or any of your assistants see any suspicious cases during that time?—None. Neither I nor any of my assistants saw any, nor did I meet with any in any Government servant.

11,401. Supposing there had been a case of plague pneumonia, would you have known of it if the case had died without having been seen by a medical man?—No, I should not have known of it.

11,402. Or a puerperal case?—No.

11,403. Or a septicæmic case?—No.

11,404. Was any public servant attacked with plague during this interval?—Not that I am aware of.

11,405. Could you tell us whether it is possible for ordinary professional men to trace the first case?—I think it is improbable if the case were not bubonic; but I think that the first bubonic cases would probably come to the notice of medical men here.

11,406. Why?—Because the people of Karachi, owing to cheap medical attendance, seek it in large numbers. They generally have recourse to medical men when ill.

11,407. We have had it in evidence in other places that the medical men themselves do not always report cases of plague?—My experience is different, because what I believe was the first bubonic case in the second epidemic was reported to me by the medical man in attendance.

11,408. We have had it in evidence that cases of plague in other places have been entered, for instance, under the denomination of asthma or chronic rheumatism, or some other name altogether. Have you any experience of that in Karachi?—We have lots of cases reported as asthma, but those cases are not reported by medical men as a rule; friends frequently give this as a cause of death.

11,409. Do you think that cases of plague have been entered under other names in the death register?—No, I do not think so.

11,410. Purposely, in order to deceive, I mean?—No, I do not think so. I have no experience of that.

11,411. Can you tell us why, in the second epidemic, the disease develcped with such startling rapidity?—On account of the rapid evacuation of the houses, and the spread of rats, I think, from empty houses.

11,412. In the first place on account of the rapid evacuation of the houses; how was that?—By the rapid voluntary evacuation of houses to begin with.

11,413. You mean to say the people spread it through the town?—The people seeing rats dying in their houses left them, going into the district or jungle, and the rats scattered through the town. The godowns from which the petty dealers obtained their supplies were the first parts badly infected.

11,414. Do you think the people themselves spread the disease?—To a much less extent than by rats.

11,415. How do you think rats spread the disease, or in what way do they contaminate human beings?—My opinion is they spread the disease by contaminating the dwelling.

11,416. But how can a rat contaminate a dwelling?—I do not know; it may be through excreta. Very probably it is excreta.

11,417. Have you any evidence to show that the excreta of rats are infectious?—No, I have had no bacteriological training at all.

11,418. Have you any clear cases where a man has been infected by a rat, in which you can absolutely exclude human agency?—Yes, I think I have got a case. A young apprenticed fitter in the railway workshops was ordered to remove a dead rat which was found in one of the drains. Instead of removing it, and throwing it into the furnace, as he was told, he swung it about his head and played with it, and ran after others with it. Three days afterwards he was admitted into the Civil Hospital with the plague. There was no plague in the camp nor in the neighbourhood of his house.

11,419. There was the dead rat?—Not in his house. This was in the workshops.

11,420. That is an individual contamination from a dead rat?—Yes.

11,421. Can you give us a case where a dwelling has been contaminated by rats, and people have got plague without any possibility of human agency?—That would be impossible to prove. In our very last case there were three people in a house who were attacked by plague, and a dead rat was found in the house. It was reported to me that for three or four days previously two or three rats a day were dying in that house.

11,422. Have you had any evidence that mice died during the epidemic?—Yes. There was an old Mahratta lady living in a good house on the Rambagh Road in which mice were the cause of infection.

11,423. Is that near an infected district?—At the time it was a long way from an infected district. The old lady, who was not in the habit of leaving the house, stated that dead mice were seen four or five days before she became ill.

11,424. Can you exclude all possibility of this lady having been contaminated by human agency?—No, I cannot exclude it, because her people may have been visiting in an infected area.

11,425. Did you find any dead mice?—No, we found very few mice.

11,426. There was a very large mortality among the rats, and a very small mortality among mice?—Yes. Mice are not very numerous, I think, in Karachi.

11,427. We have been told that the musk rats do not die. Can you tell us what kind of rat it was that died?—I have never seen a musk rat die.

11,428. Is it the common Norwegian rat that dies of plague?—Yes, I think it is.

11,429. Do you believe that the plague epidemic could spread without the agency of rats?—I think it can.

11,430. That was the case in the beginning of the first epidemic, was it not?—I was not present. May I state my opinion with regard to the course of events, where the rats have been aided in spreading the disease? The petty dealer purchases his stores in bulk from infected godowns or shops in the Market Quarter, and with them infects his own dwelling and the rats therein. The rats in neighbouring houses frequent his shop for food, and

also become infected and spread the germs. Thus there is a spread of the epidemic by a material brought from infected quarters. What the material is I cannot suggest.

11,431. I believe you evacuated whole blocks of houses, did you not?—Yes, the whole town proper was evacuated.

11,432. And you found this evacuation successful?—Yes.

11,433. Can you give us some typical examples of that?—Evacuation in its complete sense has not been the rule in Karachi, as owing to its expensive nature it was found necessary to allow the people to return to their houses in the day-time for the purpose of plying their ordinary vocations, and experience has shown that this may be done at the expense of very few cases. This nocturnal evacuation was of two kinds, voluntary and compulsory, and at about the 17th May one-third of the population I estimated had left Karachi altogether by shifting outside the town. Two months after the above date no cases were detected amongst those occupied in the day-time in their houses and shops, although up to the 30th June cases were frequent.

11,434. Do you mean the cases were frequent in the town up to the 30th June?—No, amongst those people who were outside for six weeks after they evacuated the place.

11,435. Then it broke out again?—No, it was still continuing amongst those people after they had left; some of them were in various stages of incubation when they left, and it continued amongst others who were infected inside the town when they came to their daily labour.

11,436. Do you say it had stopped by May 17th; that is what I cannot understand?—There was a certain amount of voluntary evacuation going on up to the 17th May, when an order was issued to completely evacuate the place. These people went out daily, slept out, and came in daily to their ordinary work as shopkeepers and whatever work they had to do in the town. Even after these people left cases still continued among them for six weeks.

11,437. How many cases occurred amongst the people?—I have not got the numbers.

11,438. Do you think the proportion of cases was larger among them than among the people remaining in the same camp?—The people that went to the town daily suffered the most.

11,439. Can you give us any numbers showing that?—No, I cannot.

11,440. Do you think we could get these figures elsewhere?—I think probably you could from the Superintendents of the Lyari.

11,441. How long did the epidemic last in the camp?—In the camps proper there were cases up to the 30th June.

11,442. And the people evacuated on the 17th May?—There was total evacuation on the 17th May.

11,443. When does the hot weather begin?—About March 15th.

11,444. But it is hottest here in May and June, is it not?—Yes, the temperature is highest in May, up to late in May, when the monsoon breeze commences.

11,445. Do you find plague epidemics in India have a tendency to decrease during the hot weather?—No, I do not think that the temperature has much to do with it.

11,446. Did not the epidemic in Bombay, for instance, diminish during the hot weather?—Yes, but I believe at Sukkur it was at its worst when the maximum temperature was about 115° in the shade.

11,447. Do you think the hot weather had anything to do with the disappearance of plague?—I do not think so,—not the slightest.

11,448. How was the disinfection of the town performed?—At first the cleaning and disinfection of infected houses was performed by Superintendents, and houses in which dead rats were found were disinfected by perchloride, 1 in 1,500.

11,449. An acid solution?—Yes.

11,450. How did you apply it?—By means of syringes.

11,451. You sprayed it along the walls and along the floors?—Yes.

11,452. How did you disinfect the clothing?—By phenyle solution chiefly, 5 per cent.

11,453. Is not that very strong?—It is very strong, but at the time we were not aware that the germicidal powers of phenyle were so strong.

11,454. How did you disinfect the walls?—The houses afterwards were placed under medical officers, and the walls and floors scraped and sprayed with perchloride solution.

11,455. What is the idea of scraping the floor?—The idea was that the germ permeated to a certain depth in the floor.

11,456. You find it goes into the floor?—I have no authority to say so, except that we were informed it did, to the extent of 1½ inches.

11,457. I believe the bacillus of plague is non-motile; how do you think it can get through the floor?—By growth, I suppose. I believe it extends to a certain extent in agar.

11,458. Supposing you get a tube of gelatine and put plague bacilli on the surface, do they extend any distance into the gelatine?—I do not know.

11,459. Have you any theory as to how it grows into the floor? Have you any facts to make you believe that it does so?—I have no facts at all. The only reason we have for doing so is that our surface disinfection proved a failure in so many cases.

11,460. You say in your précis of evidence that you are prepared to give evidence that disinfection is useless: do you mean that all disinfection is useless, or disinfection as carried out?—Disinfection as carried out here, owing to the structure of the houses of Karachi.

11,461. What is there in the structure of the houses which renders it useless?—They have a wattled framework with mud walls, straw, and all the ceilings are of material which is infested with rats. The rats will remain there, and you cannot get at them—dead and dying rats.

11,462. You think disinfection is useless chiefly on account of the rats?—Yes.

11,463. Do you think it is useless for the clothes and the effects belonging to the patients?—No.

11,464. Do you think it is possible to disinfect the walls and floors?—I do in a pukka house, that is, a house built of stone and cement.

11,465. You think the other houses cannot be disinfected?—I think so on account of the rats, and on account of the material which they are made of.

11,466. What is the material they are made of?—They are made of mud, straw, and horse-dung or cow-dung.

11,467. I suppose that could be scraped off, could it not?—It is mixed with the materials of construction.

11,468. The outer surface of the wall could be scraped off, could it not?—Yes; the surface can be disinfected.

11,469. You say you found disinfection useless; could you give us any typical examples of where you found it useless?—I should like to state that although my opinion with regard to the disinfection of kutcha houses is that it is almost impossible, our procedure here is to have the house in which a case of plague occurs always disinfected—not the blocks. We have examples where disinfection was carried out, and cases kept on occurring in disinfected houses.

11,470. In the same houses?—Yes.

11,471. Have you any typical cases where human agency is excluded?—No, I could not exclude human agency in any one case.

11,472. So that all these people might have caught their disease somewhere else?—Yes.

11,473. That does not exactly show that disinfection is useless?—No.

11,474. It only makes its efficacy improbable?—Yes, its thorough efficiency.

11,475. Have you any facts showing the value or non-value of segregation?—If you provide new houses for the people the value of segregation cannot be questioned, but to send the people after 10 days into their houses is courting fresh cases.

11,476. Why do you think so?—Because it has occurred time after time. People going back from segregation to those houses again have contracted plague.

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11,477. How do you think segregation should be effected?—I should think in the way in which we are doing it at present, that is, sending the family and the contacts away into huts in the open country, beyond the Lyari.

11,478. Suppose you had a very virulent epidemic of plague in Karachi, do you think that measure could be enforced?—Yes, they went out—30,000 people.

11,479. During the whole time of the epidemic?—They were out at one time.

11,480. Then you considered the measure useful at that time?—Yes.

11,481. You mean segregation under certain circumstances is useless; but here in your printed précis of evidence you have stated that segregation is useless, without making any qualification?—I used the word "unsympathetic," but I believe it is printed there as "unscientific."

11,482. Your opinion is that it is not a bad measure if it can be enforced properly, and if you can keep the people out for a long time?—That is so. Evacuation or segregation for a long period is *the* only measure.

11,483. Then you state that all cotton goods except quilted materials can be disinfected by the sun alone?—In Sind, I think so.

11,484. Can you tell us the reasons why you think so?—I have seen so many contacts in hospitals where the people have lived in the open—friends and relations of the patients living in the hospital compound without contracting the disease. Among the number of attendants, dressed in cotton clothes, who lived in the open compound, I have only known one who contracted the disease.

11,485. Were their clothes disinfected in any other way?—No.

11,486. You suppose that to be due to the effect of the sun?—Yes, the sun and air.

11,487. I do not quite know how these people are dressed; have they simply a cotton garment round them, or do they wear underclothing?—As a rule, the Musalmans in Sind wear cotton trousers, the Hindu generally wears a dhoti with a small jacket.

11,488. But the under-garments are chiefly infectious, are not they?—They have very little under-garments.

11,489. Does the sun act on the under-garments? They are covered up, are they not?—As a rule, in the heat of the day they generally go about with very little on.

11,490. Have you any other facts showing the good effects of the sun as a disinfector besides the fact just quoted?—Yes. A number of people went into the Nassarpuri camp, being sent out from infected parts, and the only disinfection carried out was exposure to the sun.

11,491. How far do you think the sun can penetrate and exert its influence?—I should think, certainly, through a thin cotton garment.

11,492. Have you any experiments bearing on that?—No, it is merely an opinion.

11,493. You state that you believe that it requires two months' exposure to air and light to render a dwelling innocuous?—Yes.

11,494. Can you tell us on what fact you base that opinion?—On the main fact of the evacuation of the town. That is to say, after six weeks we had no cases, although the people were visiting these quarters. I stated before that we had cases amongst them up to six weeks after complete evacuation.

11,495. (*The President.*) And disinfection?—No disinfection. There was disinfection of the houses but not of the people.

11,496. (*Dr. Ruffer.*) How do you attribute it simply to the exposure to air and light if the dwelling had been disinfected?—Because we are not going to the expense of disinfecting at present.

11,497. Have you any facts showing this?—Yes. Rambagh Gharri Khata furnished three cases in a week in November, after which the houses surrounded by Aba Soomar Street, Pherozeshah Street, and Kutchery Road were evacuated. They returned after two months' absence and no case since appeared amongst them. There was nothing done except the ordinary cleaning except in houses where cases occurred.

11,498. Have you any other facts?—No.

11,499. How many cases of plague did you have in these houses before you evacuated?—I do not think there was more than one in any one house.

11,500. How do you know the house was infected?—At the time plague was confined to that particular quarter.

11,501. Have you any facts showing that that very house was infected?—No facts except the fact of the occupants having contracted the disease.

11,502. How many of these occupants contracted the disease, and how long were they in the house before they were removed to camp?—I could not tell you the number of occupants who were in the house. It was a chawl, and the numbers in the compound were large.

11,503. How many had plague in that very house?—I do not think there was more than one in any one house. There was a square with rooms opening into it.

11,504. How many cases did you get in the rooms altogether?—Two in one compound.

11,505. And how many more besides?—I could not tell you the exact number—five or six in the block.

11,506. (*The President.*) A block of how many houses?—I should think about 40 houses.

11,507. (*Mr. Hewett.*) You said that cases ceased in the camp on the 30th of June. What was the state of plague in the town at that time?—The town itself was empty.

11,508. Was there nobody left in the town?—Nobody, except inoculated Khojas, I think—very few.

11,509. Was there no plague in the town then?—were cases of plague in the suburbs.

11,510. Was the epidemic virulent at the time?—No. There it was mild.

11,511. It has continued mild since then?—Yes.

11,512. Upon what date was the first case reported to you?—On the night of the 22nd of March.

11,513. Who was the individual who had plague?—He was a Sikh carpenter who lived in the Serai Quarter and who worked at the Native Jetty.

11,514. Was he a resident of Karachi?—Yes, for years.

11,515. Could you trace any connection between him and any infected place?—No.

11,516. He had been working at the Jetty?—Yes. I saw the case on the 22nd March. I was not satisfied with the diagnosis, and next morning I went to see the patient very early and examined him again, and was satisfied it was a case of plague.

11,517. Had the mortality of rats been noticed before that case?—No, not by us.

11,518. When did that first come to your notice?—When we went round to see cases Nos. 5 and 6.

11,519. What date would that be?—Either the 31st March or the 1st April.

11,520. That is 10 days after you saw the first case?—Yes.

11,521. How long did the people say this mortality among rats had been going on?—There were vague rumours that people had left the place some weeks previously, but we had nothing to go upon.

11,522. Did you feel sure that the people had been dying before this case was detected by you?—I did not feel sure.

11,523. Were there any other animals affected during the outbreak of plague?—No, except one, who was artificially inoculated, a squirrel.

11,524. Plague did not prevail among the wild squirrels?—No, it did not come to my notice.

11,525. (*Mr. Cumine.*) With regard to the fitter who swung the dead rat round his head, the dead rat had been found in a workshop, I believe?—It was found in a drain in a railway workshop.

11,526. In the workshop in which he worked?—Yes. He swung the rat round his head by the tail. That was the information I received.

11,527. Had any more rats been found in that workshop?—Not in the workshop; there were some found in the offices of the workshop.

11,528. With regard to the people who went back from the voluntary camps to their shops in the day-time, had those shops been disinfected?—Yes.

11,529. And for the first six weeks they were going backwards and forwards to their shops, there were some people who got infected by so doing?—Yes.

11,530. But after the expiry of six weeks, none of those people got infected by going to their shops?—Not as far as I understand.

11,531. So that your inference is that the germ was killed, not by the disinfection, but by the lapse of time?—Yes.

11,532. (*The President.*) Did you see many of these cases of plague yourself?—I saw a great number, but I did not treat them myself.

11,533. Did you see many corpses?—Yes.

11,534. Can you tell us if there is any peculiar appearance on the anterior portion of the body, either in the patient or in the corpse?—Nothing peculiar.

11,535. If the anterior portion of the thorax and abdomen were œdematous, could that have escaped your observation?—It might, because I did not pay any attention to it.

11,536. Did you see many cases of pneumonic plague?—Yes, I saw a few cases as I passed the patients' beds. I was not brought intimately into connexion with them.

11,537. In which part of Karachi was plague most prevalent?—In the Market Quarter, the Joria Bazar and its surroundings.

11,538. What are the chief characteristics of that quarter?—There is nothing except that it is inhabited by dealers.

11,539. Is there any characteristic of the houses and that quarter itself?—I think it is somewhat similar to the other portions of the town as far as its composition is concerned. The houses may be a little worse.

11,540. Is the population larger for the area or not?—It may be larger relatively.

11,541. Is it the part of the town in which there is the largest population for the area?—Yes.

11,542. Are the streets wide or narrow?—Narrow.

11,543. Are the houses crowded or not?—As a rule, all the houses in Karachi town are over-crowded.

11,544. Relatively to other portions of the town, are the houses there more crowded?—No, I do not think so.

11,545. Are the houses as well ventilated as in other parts?—Probably not as well ventilated.

11,546. Therefore, there are a considerable number of differences. Could you give us the population of each area in each of the chief districts in Karachi?—That information is obtainable. Dr. Kaka has got the statistics.

11,547. Did you have any experience of inoculation here?—Yes; but only of the prisoners in the jail.

11,548. Will you give us the general result of the inoculation there? Does it show anything?—Nothing. The results were negative.

11,549. How were they negative?—Because in the first epidemic the plague had ceased in the surrounding district. The surrounding district was free by the time they were inoculated in the first epidemic.

11,550. The epidemic had already passed away?—It had passed away from that part of the town.

11,551. Did any case of plague occur in the inoculated or the uninoculated people?—One mild case occurred in the jail.

11,552. In an inoculated or an uninoculated person?—In an uninoculated person. They were all uninoculated at that time.

11,553. When were they inoculated?—Inoculation commenced on the 21st March.

11,554. And when was it completed?—It was completed on the 15th June.

11,555. It was very slowly carried out?—It was done as the prisoners came in.

11,556. When was the great body of prisoners inoculated?—They were inoculated at once on that day or on the two following days after the 21st of March.

11,557. Was plague then prevalent in the surrounding districts?—No.

11,558. Was there plague in Karachi when the prisoners were inoculated?—Yes.

11,559. And did any plague cases occur in the prison?—No.

11,560. That does not show very much?—It does not show much because the place was free, all the surroundings were free.

11,561. (*Dr. Buffer.*) Did you take the temperature of these prisoners after inoculation?—Yes, in the first epidemic; I did not take them in the second.

11,562. Could you tell us what the temperatures were?—Yes; they all showed a reaction.

11,563. What was the highest temperature?—104.

11,564. And the lowest?—99.

11,565. Did they all receive the same dose?—Yes.

11,566. How did you standardise the dose?—It was done by Professor Haffkine.

11,567. You simply followed his instructions?—Yes.

11,568. Could you give us the number of prisoners and the temperatures?—Yes. The total number was 249:—

1	reached a temperature	of		99
19	,,	,,	,,	100
88	,,	,,	,,	101
93	,,	,,	,,	102
46	,,	,,	,,	103
2	,,	,,	,,	104

11,569. Did you have any abscesses?—Not among the prisoners.

11,570. Did you have any serious symptoms after inoculation?—No.

11,571. Were prisoners incapacitated from work for any length of time?—No, only for two days.

11,572. All of them?—Very nearly.

11,573. Did you find much variation in the general symptoms between them?—Yes, there was a good deal of variation, with regard to headache especially.

11,574. Did you find that the severity of the symptoms corresponded with the height of the temperature or not? Did you get severe symptoms with a high temperature or with a low temperature?—Of the 249 prisoners inoculated, 31 with temperatures of 103° and above showed severe symptoms, including headache, vomiting, and purging; 17 with similar temperatures had no severe symptoms. With temperatures below 103°, 91 showed severe symptoms; and in the remaining 110 with low temperatures the symptoms were mild.

11,575. Did you perform many inoculations outside?—Not personally.

11,576. Have you anything you would like to say about inoculation outside? Have you any facts which have come within your experience, which you would like to bring to our notice?—No.

11,577. I believe you have made some observations about the presence of primary lesions in plague patients?—In the first epidemic here I saw none, except when wounds were infected. In the second epidemic I saw what I considered primary lesions in plague, but I cannot tell you the number. There were probably about 20.

11,578. What do you mean exactly by primary lesions; do you mean scratches?—I mean a vesicle or a bulla forming on a particular place on the body, and a bubo in a corresponding position on the same limb, with plague.

11,579. Do you think that plague is generally contracted through local lesions?—They nearly all are through local lesions—probably 75 per cent. through the skin.

11,580. In cases of bubo in the neck, where is the local lesion generally to be found?—On the surface of the tonsil. I have seen a great number of cases where there have been enlarged glands in the neck, and upon examining the tonsil I have seen a grey slough on the surface of it.

11,581. We were told that cervical buboes occur with greater frequency in children than in adults; do you think children possibly inoculate themselves through lesions of the scalp? Do the children here suffer a good

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deal from favus and other diseases of the scalp?—The children here suffer from skin disease, but not often from favus; they suffer a great deal from boils in the scalp; but I can hardly think they can inoculate themselves through the scalp. I should say it was more probably from the mucous membrane of the mouth.

11,582. Do you think they could inoculate themselves in that way?—I think they might; it may be the case, because I see on the other hand men with tinea in the neighbourhood of the lumbar region: I feel convinced that they inoculate themselves in that position.

11,583. Have you ever seen cases of plague in persons suffering from lupus of the face? I do not know whether lupus of the face is common here?—I have not seen a case.

11,584. I believe you had one case of plague in the jail? Can you tell us how the case got infected?—I believe it became infected by the warders who were living in the neighbourhood of plague. I see no other means by which the man could have got it. He was five months in jail and never had any interview with anybody. He was employed altogether in wool work. All the wool was exposed and purchased in a non-infected district. It was taken from Shikarpur in Upper Sind. We could trace nothing except that the warders were living in an infected locality, and had plague amongst their neighbours.

11,585. Did you have any cases among the warders?—No.

11,586. Were the warders inoculated?—Nobody was inoculated at the time.

11,587. I may be wrong, but I believe a great many of your warders are actual prisoners, are they not?—Yes.

11,588. So that they would not be likely to bring the disease into the jail?—No. After that we put our warders under our immediate supervision.

11,589. (*The President.*) The prisoner warders are strictly confined to the prison, and the conveyance of infection into the jail could, therefore, only be through one of the official warders?—Yes.

11,590. As a matter of fact, did you find out whether any of these paid official warders, when they went outside the prison, actually came in contact with cases of plague?—I think they did; I think we found that they were in a plague-stricken neighbourhood.

11,591. You do not know if any plague was in any house which they went to, or any house which they occupied?—I could not say.

11,592. Do you know whether any of their relatives had plague?—I think so. It was proved, I believe, at the time that some of their relatives had plague.

11,593. That is to the best of your recollection?—Yes.

11,594. What do you believe was proved?—That some relatives had plague, and that they had been in the houses of those relatives.

11,595. Do you speak doubtfully with regard to this?—I do speak doubtfully, because the case occurred shortly after my coming to Karachi, and the men were immediately removed from the neighbourhood.

11,596. (*Dr. Ruffer.*) I heard it suggested that this prisoner might have contracted the disease from rats; do you think there is any likelihood of that?—I do not think so. There is a possibility of a rat inoculating the ground immediately alongside of him. The man was next the place where the vessel for the drinking water was kept, and had an infected rat come for water to that particular spot it might have inoculated that particular piece of earth.

11,597. Still the man was separated from the water, I suppose; how far was he from the water?—He was raised on an earthen bench to sleep; the water was just within reach of his hand alongside.

11,598. I believe the first epidemic here came to an end in August 1897?—Yes.

11,599. Do you remember, in September 1897, some cases of enlarged cervical glands occurring in the Runchor Lines?—I do not know whether the cases died.

11,600. I believe they were reported in September 1897 by the Deputy Commissioner and Dr. Niblock as cases of plague?—I do not remember. There was one case reported as plague by Dr. Niblock. It was the case of a tramway employé. I could not give you any date.

11,601. I believe it was decided here that it was not plague?—Yes. Inquiry was made, but no trace could be found of his having had communication with plague people from plague places. Karachi had been free from plague before. After inquiry by the Board it was decided that it was not a case of plague.

11,602. Did this case die?—The case was not seen in life.

11,603. He was found dead?—Yes.

11,604. What did the Committee decide he died of?—At the time I did not know what the truth of it was. We heard that he had been treated for some heart complaint.

11,605. He had very large glands in the neck, had he not?—I did not see the case.

11,606. Why did Dr. Niblock think it was plague?—Simply from the appearance of these glands.

11,607. Was not the Deputy Sanitary Commissioner of opinion that it was a case of plague?—I do not think the Deputy Sanitary Commissioner saw him. Nobody saw the case except Dr. Niblock.

11,608. Do you know where we could find a record of this case?—I do not think any notes were made. The man had been treated by a private practitioner, who has died since. His report was that he had treated the case for some time previous for some bronchial catarrh or heart complaint, I really forget now.

11,609. At the time when the man with enlarged cervical glands was reported by Dr. Niblock as a case of plague, had there been any suspicious cases of plague in the town?—At that time I had absolutely nothing to do with plague, except so far as hospital work was concerned. I had nothing to do with plague nor with the death rate at the time.

11,610. You do not know, then?—I do not know anything about it. Capt. Arnim was in charge of the Deputy Sanitary Commissioner's office at the time.

11,611. When you found the first case in the second epidemic, was not a boy discovered with a large femoral gland?—Yes. I inquired into the history. There was an old bubo, and as far as we could find out, it had been going on for some time. He had been under treatment in the Civil Hospital for this bubo.

11,612. What was it due to?—It was a strumous gland—an enlarged gland—as far as I could make out.

11,613. Are many natives leaving the town now?—I do not think they are leaving now, but they were leaving some time ago, about this day week.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Frere Hall, Karachi.

THIRTY-THIRD DAY.

Tuesday, 24th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Mr. A. CUMINE.
Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Mr. S. M. KAKA called and examined.

Mr. S. M. Kaka.

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11,614. (*The President.*) You are Health Officer of the Karachi Municipality?—Yes.

11,615. What are your medical qualifications?—Member of the Royal College of Surgeons, England, Licentiate of the Royal College of Physicians, London, and Diplomate of Public Health, London.

11,616. (*Dr. Ruffer.*) Were you Medical Officer of Health in Karachi during both epidemics?—Yes.

11,617. Did the first epidemic begin in December 1896 and end in July 1897?—Yes.

11,618. You saw all the measures taken during that period?—Yes.

11,619. Was segregation enforced during that epidemic?—Not till the Plague Committee came into force.

11,620. When did the Plague Committee come into force?—At the end of March 1897.

11,621. Was the epidemic declining at that time?—It was declining.

11,622. Was the segregation voluntary?—There was compulsory segregation of contacts.

11,623. How was that enforced?—No sooner was a case reported in a house than the Superintendent of the quarter went to the place, or his subordinate went, and found out exactly how many persons were in the house, and took a note of that. After the body was disposed of or sent to the hospital the people were all removed to the camp.

11,624. How did the Superintendent of the quarter ascertain the number of people living in the house?—I cannot tell you that. They took away as many as were there.

11,625. Do you think everybody was got hold of, or did a certain number of people escape?—Very likely a certain number escaped.

11,626. Have you got a census of each house in Karachi?—No.

11,627. During the second epidemic you enforced segregation on a large scale?—Yes, from the commencement.

11,628. What is the total number of people segregated at any one time?—The maximum number at one time during a week was 934 for the week ending the 29th April 1898.

11,629. That was compulsory segregation?—That was compulsory segregation.

11,630. A certain number of people evacuated their houses and went into camp voluntarily, did they not?—There were two sorts of camps. Camps that were watched—"contact camps," in the true sense of the word—and "health camps," or voluntary camps, where there may or may not be any contacts.

11,631. Not counting the contacts, how many people were there in health camps at any one time?—The maximum number at one time in all the camps in Karachi was 26,000—perhaps more.

11,632. Do you think it would have been possible to turn out a larger number of people?—No, I do not think so.

11,633. What do you think is the maximum number of people that you could accommodate in segregation camps outside the city?—The maximum accommodation provided is for about 1,500 people.

11,634. What is the population of Karachi at the present time?—At the census, 98,000 odd, within Municipal limits.

11,635. Do you think that, as a rule, the people like to go into segregation camps?—I do not think so.

11,636. Do they object to it?—Yes.

11,637. Unless they go out voluntarily for some reason of their own?—Yes.

11,638. Do you think that people, fearing the segregation camp, try to escape?—I should certainly say yes.

11,639. Will you give us some examples of that?—I cannot give you any examples.

11,640. That is your impression?—That is my impression.

11,641. As a rule, when do you find out that there is a case of plague in a house?—Generally when the patient is either moribund or dead, and also when a neighbour hears of a case in a house and reports it.

11,642. How long after the patient's death or getting the report do you get into the house?—That depends at what time the patient dies. If he dies after 6 o'clock in the evening, when they are all away, he would not be removed till the next morning.

11,643. Do you think the other people in the house try to escape during the interval elapsing between the death and your entrance into the house?—Yes. They might remain until the morning, but before the Superintendent turns up, they would be all gone—perhaps three or four—the father and the mother and the son may be there.

11,644. Do they take their clothes or effects with them?—Very likely they do.

11,645. Do you think they are likely to carry the plague with them?—I think so.

11,646. Were you in charge of the disinfection arrangements during the first epidemic?—Yes, before the formation of the Plague Committee.

11,647. How was the disinfection performed?—When we heard of a case after the body was disposed of or the patient sent to hospital, generally we got into the house and turned out all the movable furniture, swept the walls, floors, and the ceilings with a broom, or a pole with a brush at the end, sprayed freely the whole place—floors, walls, ceiling, &c.—with solution of perchloride 1 in 1,000, and then turned out all the rags, rubbish, &c. into the street, and had a big bonfire made of all the things, burning the scrapings of walls and the loose earth of floors. In all the places also we got into the moris or nahnis—the bath rooms and other conveniences—and disinfected the pipes, drains—in fact, everything.

11,648. How did you disinfect the house?—With perchloride of mercury, and spraying with a common garden pump.

11,649. Anything else?—Digging up floors. Subsequently, after the whole thing was done, we limewashed and kept the doors and windows open, and wherever we found the ventilation deficient we knocked holes in the walls and opened up the roofs by untiling them. Mat huts were destroyed by fire.

11,650. How did you disinfect the clothes of the patients?—Generally they were burnt in those days. The actually infected articles were burnt; silks and things of that kind, presumably not infected, were exposed to the sun and air. Those in the sick-room were all destroyed including the mattresses, pillows, palliasses and the like.

11,651. Did you find that people objected greatly to disinfection?—Yes, they did, when we started originally. In my report* on the first epidemic I have made a note of that. I said, "Even the sanctioned "measures put into execution met with opposition. "On the 7th January 1897, a meeting of the leading "Muhammadans of the City was held at the Mukhtyarkar's Office, under the presidency of the Collector

* Not reprinted with the Proceedings of the Commission.

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" of Karachi, where the measures that were sanctioned " by the Commissioner in Sind were explained to " them; yet within a few days of this meeting, on the " 18th idem, obstruction was offered to the Municipality by some Muhammadans residing in the village " of Nawabad in the Lyari Quarter on my proceeding " to enter their premises to do the needful acts prescribed by the Municipality. The Collector of " Karachi on being informed of the opposition shown " by the Muhammadans came in person with his officers " on 19th January 1897; as nothing could be done " with these refractory persons, proceedings were " instituted, and seven persons were convicted, and " sentenced to one month's rigorous imprisonment."

11,652. Did they object to disinfection or to their things being burnt?—Generally, I say to both.

11,653. Were you in charge of the disinfection during the second epidemic?—No.

11,654. Did you see the disinfection done during the second epidemic?—No, I did not pay particular attention to it.

11,655. Is there any disinfection being done now?—I am told it has been stopped.

11,656. Are you sure of this?—I cannot say that I am sure, but when I was in town four or five days ago, I learnt that orders had been given not to proceed with disinfection with perchloride.

11,657. Supposing a case of plague occurs in a house now, what measures do you take?—I do not take steps, but the Plague Committee does; generally turning out the patient, and sending him to hospital, or ordering him out of the town into one of these open encampments, with his relations and friends.

11,658. Would you disinfect the clothes?—I cannot tell you that.

11,659. Who can tell us that?—I think Dr. McCloghry, the Civil Surgeon, or some other member of the Plague Committee.

11,660. You have handed in a table giving the average population of the contact camps week by week; and also the weekly number of plague cases and deaths. Will you hand in that table so that it may be put into your evidence?—Yes. The table is as follows:—

Week ending.	Mortality from Plague in Karachi.	Mortality from all other Causes.	Total.
4th November 1898 -	3	43	46
11th " " -	1	66	67
18th " " -	6	67	73
25th " " -	—	57	57
2nd December " -	—	39	39
9th " " -	1	63	64
16th " " -	2	75	77
23rd " " -	—	77	77
31st " " -	1	90	91

The total number of contacts segregated in the principal segregation camps was as follows:—

(1) Lawrence Road Camp opened on 25th March 1898 and closed on 11th December 1898. During the period, 8,421 persons were segregated.

Lyari Segregation Camp—

(1) Gul Muhammad Lines Camp opened on 12th April 1898 and closed on 20th August 1898. During the period, 1,139 persons were segregated.

(2) Idgah Camp opened on 14th April 1898 and closed on 11th June 1898. During the period, 69 persons were segregated.

(3) Khada Camp opened on 25th April 1898 and closed on 9th July 1898. During the period, 586 persons were segregated.

The average period of detention in each camp was 10 days.

The average population of contact camps week by week with the weekly number of plague cases and deaths was as follows: no record is kept of the mortality from other causes in segregation camp:—

Week ending	Lawrence Road Camp.			Gul Muhammad Lines Camp.			Idgah Camp.			Khada Camp.		
	Average Population.	No. of Plague Cases.	No. of Plague Deaths.	Average Population.	No. of Plague Cases.	No. of Plague Deaths.	Average Population.	No. of Plague Cases.	No. of Plague Deaths.	Average Population.	No. of Plague Cases.	No. of Plague Deaths.
25th March 1898 -	—	—	—	—	—	—	—	—	—	—	—	—
1st April " -	—	—	—	—	—	—	—	—	—	—	—	—
8th " " -	—	2	2	—	—	—	—	—	—	—	—	—
15th " " -	314	8	7	15	—	—	—	—	—	—	—	—
22nd " " -	625	11	7	86	—	—	11	—	—	—	—	—
29th " " -	924	20	12	132	—	—	12	—	—	2	—	—
6th May " -	750	20	13	217	1	—	5	1	1	44	—	—
13th " " -	796	30	21	235	2	1	35	—	—	118	—	—
20th " " -	677	13	13	125	1	—	30	1	1	164	3	1
27th " " -	569	10	5	108	—	—	8	—	—	183	—	—
3rd June " -	753	4	4	120	—	—	7	—	—	145	4	1
10th " " -	501	7	6	85	—	—	3	—	—	121	—	—
17th " " -	418	2	1	48	1	1	—	—	—	66	—	—
24th " " -	446	5	4	40	—	—	—	—	—	29	—	—
1st July " -	318	—	1	18	—	—	—	—	—	33	—	—
8th " " -	366	1	1	7	—	—	—	—	—	18	—	—
15th " " -	192	4	2	2	—	—	—	—	—	—	—	—
22nd " " -	228	—	1	3	—	—	—	—	—	—	—	—
29th " " -	286	2	2	2	—	—	—	—	—	—	—	—
5th August " -	448	3	3	13	—	—	—	—	—	—	—	—
12th " " -	296	1	1	4	—	—	—	—	—	—	—	—
19th " " -	337	2	1	6	—	—	—	—	—	—	—	—
26th " " -	324	4	3	—	—	—	—	—	—	—	—	—
2nd September 1898 -	160	1	—	—	—	—	—	—	—	—	—	—
9th " " -	81	2	—	—	—	—	—	—	—	—	—	—
16th " " -	196	3	1	—	—	—	—	—	—	—	—	—
23rd " " -	524	—	2	—	—	—	—	—	—	—	—	—
30th " " -	111	—	—	—	—	—	—	—	—	—	—	—
7th October " -	58	—	—	—	—	—	—	—	—	—	—	—
14th " " -	96	—	—	—	—	—	—	—	—	—	—	—
21st " " -	37	—	—	—	—	—	—	—	—	—	—	—
28th " " -	56	—	—	—	—	—	—	—	—	—	—	—
4th November " -	74	—	—	—	—	—	—	—	—	—	—	—
11th " " -	30	—	—	—	—	—	—	—	—	—	—	—
18th " " -	26	—	—	—	—	—	—	—	—	—	—	—
25th " " -	5	—	—	—	—	—	—	—	—	—	—	—
2nd December " -	4	—	—	—	—	—	—	—	—	—	—	—
9th " " -	7	—	—	—	—	—	—	—	—	—	—	—
16th " " -	—	—	—	—	—	—	7	—	—	—	—	—

11,661. How many cases and deaths altogether had you in Lawrence Road Camp?—155 cases and 114 deaths.

11,662. How long was it before plague disappeared in that camp?—The last cases were reported on the 16th September, and three cases during the following week.

11,663. That is 23 weeks, is it not?—25 weeks.

11,664. Plague stopped quicker in the other camps?—The other camps were closed earlier than the Lawrence Road Camp, which is the main camp in the town.

11,665. You said new people were constantly coming in?—They come and go.

11,666. I suppose there were several cases of re-infection from the town in the first camp?—Yes; contacts brought the plague as they came in.

11,667. Do you know whether any people who had been in the camp got the plague after leaving it?—I know of one or two instances.

11,668. So that your figures do not really represent the total mortality in the camp?—The figures represent the mortality among the people for the time they were residing in the camps. They had done their 10 days and gone out. Those people in the segregation camp are not supposed to do more than 10 days, except in certain cases where the Superintendent has some suspicion, and wants to keep them longer.

11,669. Was there plague in the segregation camps the whole time?—Among contacts, yes.

11,670. Then what was the advantage of compelling people to go into segregation camps instead of leaving them in the town?—I cannot tell you that. Very likely the idea was that those who remained in the town were more likely to spread the disease than those who were in the segregation camps, which were watched. I could give you a daily statement which is more accurate of the numbers coming in and going out.

11,671. Can you give us the total number of people who went through the camps?—They are given in the figures I have already handed in about segregation camps, viz.:—

Lawrence Road Camp - -	8,421	persons.
Gul Muhammad Lines Camp -	1,139	,,
Idgah Camp - -	69	,,
Khudda ,, - - -	586	,,

11,672. Will you also give us the total number of deaths in the camp?—The cases and deaths are given in the figures I have just referred to, as follows:—

Lawrence Road Camp	155 cases.	114 deaths.
Gul Muhammad Lines Camp - -	5 ,,	2 ,,
Idgah Camp - -	2 ,,	2 ,,
Khudda ,, - -	7 ,,	2 ,,

11,673. Were the people living in the segregation camps allowed to go to their business every day?—No.

11,674. Were they not allowed to enter the town?—No, not at the commencement.

11,675. Afterwards they were, were not they?—Those who had to go to offices, were allowed to go during the day to their places of business, and they came back in the evening into the camp.

11,676. Had their offices been disinfected?—I do not know. I should not think so.

11,677. They went back from a camp supposed to be free from plague into their offices and houses. I want to know whether, meanwhile, their houses had been disinfected?—I cannot tell you that.

11,678. Could you give us the date when people were first allowed to go back to their houses during the day?—No, I cannot, not to their houses, but to their offices. Suppose a man is employed in a firm, or a Municipal or Government office, if he is segregated on account of a case, and if the work in his office suffers, he goes to his office in the morning and comes back in the evening. He does not go to his house at all.

11,679. In the voluntary camps the people were allowed to come and go as they like, were they not?—Yes.

11,680. Did you get any cases of plague in these voluntary camp?—Yes, a number.

11,681. How many? Can you give us a statement as to the total number of cases that occurred in the voluntary camps?—I have the total number here, as follows:—

Week ending	Nassarpuri Camp.		Trans-Lyari Camp.	
	Cases.	Deaths.	Cases.	Deaths.
25th March 1898 -	—	—	—	—
1st April ,, -	—	—	—	—
8th ,, ,, -	—	—	—	—
15th ,, ,, -	—	—	—	—
22nd ,, ,, -	—	—	—	—
29th ,, ,, -	—	—	—	—
6th May ,, -	2	2	80	73
13th ,, ,, -	—	—	144	123
20th ,, ,, -	2	1	145	143
27th ,, ,, -	5	3	190	71
3rd June ,, -	—	—	64	49
10th ,, ,, -	2	2	44	36
17th ,, ,, -	—	—	30	28
24th ,, ,, -	—	—	14	8
1st July ,, -	—	—	8	5
8th ,, ,, -	—	—	2	3
15th ,, ,, -	—	—	4	1
22nd ,, ,, -	—	—	1	4
29th ,, ,, -	—	—	—	—
5th Aug. ,, -	—	—	2	1
12th ,, ,, -	—	—	—	—
19th ,, ,, -	—	—	1	—
26th ,, ,, -	—	—	1	—
2nd Sept. ,, -	—	—	1	1
9th ,, ,, -	—	—	—	—
16th ,, ,, -	—	—	—	—
23rd ,, ,, -	—	—	—	—
30th ,, ,, -	—	—	—	—
7th Oct. ,,	—	—	—	—
14th ,, ,, -	—	—	—	—
21st ,, ,, -	—	—	—	—
28th ,, ,, -	—	—	—	—
4th Nov. ,, -	—	—	—	—
Total - -	11	8	631	546

11,682. How does the mortality in voluntary camps compare with the mortality in the town?—It is declining rapidly.

11,683. When did the plague disappear in the voluntary camps?—Dropping cases continued up till the 2nd September 1898, when the last case was reported.

11,684. At that time the epidemic had not stopped in the town?—No, it had not.

11,685. When did the epidemic begin to decline in the town itself?—The maximum number of cases and deaths (including those in camp) recorded for the week ending 6th May was 645 and 537; after that we had 608 and 487; then, the week ending 20th May, 408 and 367; the week ending 27th May, 280 and 207; and so on.

11,686. It began to decline in May and June?—From the beginning of May.

11,687. It declined in a similar manner in the camps?—Yes, in the camps too.

11,688. Did you notice a decline in the camps before the town?—Practically speaking, the native town was empty, and there were not cases occurring in it at all. All the people that were in the native city were in these camps.

11,689. And the rest of the town was free?—No; the native city was empty—there was nobody there to die or to be attacked.

11,690. (*The President.*) What population had you in the camps?—26,000 odd was the total population in the camps.

11,691. (*Dr. Ruffer.*) But the population of the town is 98,000?—These people came from certain quarters that were evacuated.

11,692. Was there no plague amongst the people left in the town?—Oh, yes, in other quarters there was. The particular quarters that were vacated were the Old

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Town, Napier, Market, and Machi Miani, and part of the Lyari, and the aggregate population of those districts comes up to 40,000. Many must have run away out of the town; a good number must have gone by land and sea after doing their usual detention.

11,693. Why did they run away?—I suppose because of the plague and the fear of the measures.

11,694. What do you think was the chief cause of their running away—the plague or the plague measures?—I should say both.

11,695. But what do you think was the chief cause?—Both the plague and the measures.

11,696. You will not commit yourself to either?—I hardly like to.

11,697. You have given us a "Report on the Effect "of Preventive Inoculation with Professor Haffkine's "Prophylactic."* I take it that there were six persons who were in charge of these inoculations?—Yes.

11,698. How were these six medical officers trained?—Three are Commissioned Officers, and there is an Hospital Assistant and a Senior Apothecary and myself.

11,699. Did you reject many of the bottles of Haffkine's prophylactic fluid?—Yes; those that were cracked on the way, and those in which the corks were more or less out of order.

11,700. Did you find that even when the corks and the bottle were intact, some bottles were putrid?—No, I did not find any.

11,701. They were all good?—Yes.

11,702. How did you standardise the fluid before injection?—We did not do it. They sent us everything complete from Bombay with the label on.

11,703. You simply injected the dose written on the label?—Yes, whatever they said. If it was twice the standard dose, twice the standard dose was inoculated.

11,704. Did you notice any bad effects from the inoculation of Haffkine's fluid?—Abscesses at the point of inoculation.

11,705. How many?—I had about three.

11,706. Do you know whether any of the other gentlemen had abscesses in their practice?—I do not know.

11,707. Did you ever get symptoms such as collapse and high fever?—Yes, one. I had symptoms of rapid collapse in a girl of 15 years of age immediately after inoculation. It may be due to the fear of inoculation itself.

11,708. What rise of temperature did you get from the inoculation?—In my own case it was 105.

11,709. Will you describe your symptoms?—I was inoculated in the town, about 10 o'clock in the morning I went home, and at about a quarter past 11 I had slight shivering followed by regular rigors, then high fever. My temperature commenced to rise until about 11 o'clock in the night, when it was 105. I had a painful swelling at the seat of inoculation, and in one of the armpits. The next morning the temperature went down to 100, and by the evening I was all right.

11,710. Did you ever see any other cases of fainting or similar serious symptoms?—No, except this case of collapse I have told you of.

11,711. No fatal results?—No.

11,712. You think on the whole that inoculation is harmless?—I think so.

11,713. How were the figures in your paper ascertained? First of all, how did you ascertain the total population in Karachi?—I estimated the population from the observed rate of increase between the census years 1881 and 1891.

11,714. When was the last census taken?—1891 was the last census, and so I calculated every year till 1898, and I found the population 124,000 odd.

11,715. What was the population at the beginning of the epidemic?—I should say about what it was at the census.

11,716. About 98,000?—Yes, about 98,000; that is to say, both epidemics put together would have reduced the population by over 25,000.

11,717. That is an approximate estimate?—That is an approximate estimate.

11,718. You give some statistics about the Panjabhai Khojas; how did you ascertain their numbers—by house-to-house visitation?—The majority of them live in three centres of the town—one is the Machi Miani Quarter, and a small block in the Lyari, called the Miranpir; and the gardeners live in the Garden Quarter.

11,719. Is it an approximate estimate?—No.

11,720. You think the figures are absolutely accurate?—Yes, absolutely accurate.

11,721. You give a list of occupations of Panjabhai Khojas?—Yes.

11,722. On adding up the list I find it only comes to 418. There were 2,000 Khojas. Who are the other Khojas?—Women, children, and people who have no occupation.

11,723. Is the Khoja community a rich community?—Fairly rich, I should say, compared to the other classes.

11,724. I see there are only 18 coolies; is that a large number for a community of that size, or little?—I should say little.

11,725. Have you found that in other communities the plague was more marked among the poorer people or the richer people?—The poorer people.

11,726. The coolies, for instance?—The coolies, yes. I have got here the statement of occupations.

11,727. Would you give us that?—Out of a total of 1,705 cases, where the occupation of the affected is known, up to the end of September there were 51 carpenters, 75 beggars, 2 stokers, 3 schoolmasters, 22 clerks, 16 students, 10 who worked at the docks as weighmen, 528 coolies, 28 peons, 23 dealers in grain, 11 in flour, and 22 in other food stuffs, 23 cooks, 18 bakers, 7 grocers, 20 native cigarette sellers, 58 merchants, 5 pensioners, 3 domestic servants, 11 prostitutes, 16 brokers, 16 goldsmiths, 23 masons and gundies, 1 moulder, 3 grass sellers, 2 contractors; then come other petty occupations; then 29 tailors, 28 weavers and spinners, 39 bhungis and sweepers, 59 private servants, and so on.

11,728. You give in your précis of evidence the mortality of the City of Karachi for three months before the plague, and the mortality among the Panjabhai Khojas. Could you put that table in evidence?—Yes, the tables are as follows:—

CITY OF KARACHI.

TOTAL GROSS MORTALITY in the THREE AGE-GROUPS of PERSONS for a Period of three months preceding the appearance of PLAGUE in the City of KARACHI.

Week ending	Under 5 Years of Age.	5–59.	60 and upwards.	Age Unknown.	Total.
31st December 1897 -	33	32	15	—	80
7th January 1898 -	42	22	12	—	76
14th " " -	37	35	18	—	90
21st " " -	36	32	15	—	83
28th " " -	33	22	18	—	73
4th February " -	24	30	10	—	64
11th " " -	34	34	11	—	79
18th " " -	26	28	16	1	71
25th " " -	40	35	11	—	86
4th March " -	28	36	19	—	83
11th " " -	27	29	13	—	69
18th " " -	20	29	13	—	62
25th " " -	26	26	5	—	57
Totol -	406	390	176	1	973

* *See* Appendix No. XI. in this Volume.

PANJABHAI KHOJAS.

TOTAL GROSS MORTALITY in each of the THREE AGE-GROUPS of the PANJABHAI KHOJAS for a period of three months preceding the appearance of PLAGUE in the Town of KARACHI.

Week ending	Under 5 Years of Age.	5–59.	60 and upwards.	Total.
31st December 1897	—	—	—	—
7th January 1898	2	—	—	2
14th „ „	2	—	—	2
21st „ „	2	—	—	2
28th „ „	—	—	—	—
4th February „	—	1	—	1
11th „ „	—	—	—	—
18th „ „	4	—	1	5
25th „ „	1	1	—	2
4th March „	1	—	1	2
11th „ „	—	—	1	1
18th „ „	1	2	—	3
25th „ „	3	—	—	3
Total	16	4	3	23

11,729. I think the average mortality is about the same in both?—I think so.

11,730. You also give the gross mortality, excluding plague, among the Panjabhai Khojas during the epidemic, and a similar statement regarding the remainder of the population in the town?—Yes.

11,731. Is the average mortality the same in both?—It is slightly less in the Khojas.

11,732. So that there was not an increased mortality from other causes amongst the Khojas?—No.

11,733. That seems to show that you got hold of every case of plague, that your statistics are accurate?—You might say fairly accurate.

11,734. Let us take the inoculated Punjabhai Khojas first. In your précis of evidence you give a census of the Panjabhai Khojas as follows:—

	Inoculated.	Uninoculated.
(*a*) Under 5 years -	168	106
(*b*) 5–59 years -	1,657	292
(*c*) 60 and upwards -	73	30

There were 73 inoculated people of 60 years and upwards, and 30 uninoculated?—Yes.

11,735. What was the mortality from plague among the uninoculated under 5 years of age, from 5 to 59, and 60 and upwards?—It is as follows, with similar details for the City of Karachi and the inoculated:—

KARACHI CITY.

GROSS MORTALITY in the CITY of KARACHI.

Week ending	Gross Mortality from Plague.				Mortality from all other Causes.				Total.
	Under 5 Years of Age.	5–59.	60 and upwards.	Total.	Under 5 Years of Age.	5–59.	60 and upwards.	Unknown.	
1st April 1898	—	—	—	—	19	28	12	—	59
8th „ „	—	11	2	13	24	37	10	—	71
15th „ „	3	46	3	52	26	30	9	—	65
22nd „ „	1	125	5	131	29	19	5	—	53
29th „ „	9	200	12	221	30	18	17	—	55
6th May „	13	481	43	537	24	37	5	—	66
13th „ „	13	428	46	487	20	53	18	—	91
20th „ „	9	326	32	367	20	38	18	—	76
27th „ „	7	189	11	207	34	30	5	—	69
3rd June „	2	144	6	152	18	28	7	—	53
10th „ „	4	86	11	101	13	21	10	—	49
17th June 1898	—	67	7	74	19	31	8	—	58
24th „ „	1	32	1	34	31	20	10	—	61
1st July „	1	17	4	22	21	24	3	—	48
8th „ „	—	13	1	14	38	18	9	—	65
15th „ „	—	7	2	9	18	7	6	—	41
22nd „ „	—	14	3	17	20	13	6	—	39
29th „ „	—	19	—	19	35	22	6	—	63
5th August „	1	14	—	15	23	16	8	—	47
12th „ „	2	9	—	11	34	17	6	—	53
19th „ „	—	5	—	5	35	22	10	—	67
26th „ „	—	10	—	10	36	20	7	—	63
2nd September „	—	5	—	5	34	20	9	—	63
9th „ „	—	1	—	1	32	15	10	—	57
16th „ „	1	2	1	4	25	18	5	—	48
23rd „ „	—	7	—	7	27	18	6	—	51
30th „ „	—	1	—	1	21	19	5	—	45
7th October „	—	5	—	5	12	14	6	—	32
14th „ „	—	5	—	5	20	24	7	17	68
21st „ „	—	1	—	1	35	24	—	—	69
28th „ „	—	1	—	1	23	19	9	—	51
4th November „	—	3	—	3	20	15	8	—	43

GROSS MORTALITY from PLAGUE among the PANJABHAI KHOJAS.

(*Uninoculated.*)

Week ending	Under 5 Years of Age.	5–59.	60 and upwards.	Total.
1st April 1898	—	—	—	—
8th „ „	—	—	—	—
15th „ „	—	—	—	—
22nd „ „	—	—	—	—
29th „ „	1	—	1	2
6th May „	1	12	1	14
13th „ „	—	3	—	3
20th „ „	—	6	—	6
27th „ „	—	—	—	—
3rd June „	—	2	—	2
10th „ „	—	—	1	1
Total	2	23	3	28

(*Inoculated.*)

Week ending	Under 5 Years of Age.	5–59.	60 and upwards.	Total.
1st April 1898	—	—	—	—
8th „ „	—	—	—	—
15th „ „	—	—	—	—
22nd „ „	—	—	—	—
29th „ „	—	—	—	—
6th May „	—	—	—	—
13th „ „	—	1	—	1
20th „ „	—	5	—	5
27th „ „	—	—	—	—
3rd June „	1	1	—	2
10th „ „	—	—	1	1
Total	1	7	1	9

11,736. Roughly speaking, the mortality among the uninoculated was very much larger than the mortality among the inoculated from plague?—Yes.

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11,737. Did you reject anybody who applied for inoculation?—No, except infants in arms under one. We did not do them under one year—at least I did not.

11,738. Did you do all the inoculations among the Khojas?—Almost all.

11,739. Why did you exclude all children under one?—Because I think they are not subject to plague. If you look at the statistics you will find that children under one year of age generally escape plague.

11,740. Will you put in a table showing the gross mortality among the Panjabhai Khojas from causes other than plague?—Yes. It is as follows:—

GROSS MORTALITY among the PANJABHAI KHOJAS from all CAUSES other than PLAGUE.

Week ending	Inoculated.				Uninoculated.			
	Under 5 Years.	5-19 Years.	60 and upwards.	Total.	Under 5 Years of Age.	5-59.	60 and upwards.	Total.
1st April 1898	—	—	—	—	2	—	—	2
8th „ „	—	—	—	—	—	—	—	—
15th „ „	—	—	—	—	2	1	—	3
22nd „ „	—	—	—	—	1	1	—	2
29th „ „	—	—	—	—	1	2	1	4
6th May „	—	—	—	—	—	2	—	2
13th „ „	—	—	—	—	—	6	1	7
20th „ „	—	—	—	—	2	1	1	4
27th „ „	—	—	—	—	4	—	—	4
3rd June „	—	—	—	—	1	1	—	2
10th „ „	—	—	—	—	—	—	1	1
17th „ „	—	—	—	—	—	—	—	—
24th „ „	—	—	—	—	1	—	—	1
1st July „	—	—	—	—	1	1	—	2
8th „ „	—	—	—	—	1	—	1	2
15th „ „	—	—	—	—	—	—	—	—
22nd „ „	—	—	—	—	2	—	—	2
29th „ „	—	—	—	—	1	—	—	1
5th Aug. „	—	—	—	—	—	1	—	1
12th „ „	—	—	—	—	2	—	1	3
19th „ „	—	—	—	—	—	—	—	—
26th „	—	—	—	—	—	—	—	—
2nd Sept. „	—	—	—	—	1	—	1	2
9th „ „	—	—	—	—	2	—	—	2
16th „ „	—	—	—	—	—	—	—	—
23rd „ „	—	—	—	—	—	—	—	—
30th „ „	—	—	—	—	2	—	—	2

11,741. If the inoculated and uninoculated belonged to the same classes, would you expect the average mortality from general causes to be the same in both?—I should expect so, certainly.

11,742. In your table among the inoculated people you had no deaths?—No deaths.

11,743. What was the total number of inoculated people?—1,898.

11,744. And 428 uninoculated?—Yes.

11,745. The 428 uninoculated people had 49 deaths?—Yes, up to the week ending 30th September.

11,746. How do you account for the difference in the mortality from general causes among inoculated and non-inoculated?—I cannot account for it unless it is that inoculated persons resist disease more than non-inoculated. It is a pure theory. I cannot account for it, but the fact is there, that not a single death from other causes is recorded amongst inoculated in those weeks.

11,747. What was the number of inoculated children under five years of age—168, was it not?—Yes, 168.

11,748. And uninoculated 106?—Yes.

11,749. Of the inoculated children under five years of age not a single one died?—No.

11,750. In the uninoculated there were 26 deaths from general causes?—Yes.

11,751. Is not that a very high mortality?—Yes.

11,752. Is it possible that some of the deaths among the inoculated were wrongly classified?—I cannot tell you. So far as the names go they are quite different—the names of the dead persons, the infants, and these children.

11,753. There must be an explanation of this. A slight difference might be easily explained, but this difference is enormous?—I cannot account for it. We went over the registers, and found that all these names put down as inoculated people are those that were not in our own registers. Their names were not to be found. Possibly it may be that they had given wrong names of inoculated people, and put them down as uninoculated, but I do not see any object in that at all.

11,754. You see no object in it?—No, there can be no object in concealing a death of the inoculated from other causes.

11,755. Did you give any special liberties to people who had been inoculated for getting away from the city?—None, so far as I know.

11,756. Then you do not think more inoculated people might have left the city?—No, I do not think so. They had to do their detention just the same. The only advantage was that they remained in their own houses; they were not turned out.

11,757. Have you any explanation of these figures?—No, I have none.

11,758. Could you give me the results of inoculation among the people in the town?—I say in my report*: "It is not practicable to come to any definite conclusion "as to the efficacy of inoculation in the absence of "correct information regarding the population of "Karachi during the second epidemic of plague. * * "* * Assuming, then, that the average population "(excluding persons who died from all other causes, "with the exception of plague, from the commencement of the outbreak up to the week ending 12th "August 1898) within the Municipal limits of Karachi "during the second outbreak was 98,195, and, deducting "therefrom the 6,106 inoculated persons, the number "of uninoculated comes up to 92,089. The first case of "the second outbreak was reported on 25th March 1898. "Up to the week ending 12th August last 3,154 cases, "with 2,483 deaths, were reported from plague "throughout the whole of Karachi. Excluding 21 "cases with 12 deaths occurring within Cantonments, "which is outside Municipal limits, and 10 cases and "9 deaths that were imported, the total cases and "deaths in both inoculated and uninoculated up to "12th August 1898 were 3,123 and 2,462 respectively. "During the 14 weeks commencing from the week "ending 13th May to the week ending 12th August "1898, 44 cases of plague, with 25 deaths, were reported "among the inoculated."

11,759. Is that a larger or a smaller proportion of deaths as compared to the case mortality?—As compared with the general case mortality it is certainly less. "Three cases with no deaths were reported during "the week ending 21st October 1898. As these have "occurred among persons five months after inoculation, "they have not been taken into account."

11,760. Why not?—I am under the impression that in persons once inoculated the immunity wears off with time, certainly in about five months.

11,761. What evidence have you got to show that?—I read it in the papers that, unless a man has been re-inoculated within five months, the effects wear off.

11,762. Could you give us the reference?—I have not the paper.

11,763. Was it a medical newspaper?—No, it was a statement in a local newspaper.

11,764. Have you any facts of your own to show that the statement is correct?—Except those three cases there is nothing further to show.

11,765. Please proceed?—"Within the Municipal "limits of Karachi, then, up to the week ending 12th "August 1898, the 92,092 uninoculated persons had "3,079 cases and 2,437 deaths, and the 6,103 inoculated "had 44 cases and 25 deaths from plague among them. "In the former case, the total mortality from plague "comes up to 2·6 per cent., and the case mortality

* *See* Appendix No. XL. in this Volume.

" (*i.e.*, the percentage of deaths to attacks) to 79 per " cent. In the latter case, the total mortality comes " up to 0·4 per cent., and the case mortality to 56 per " cent. Calculated upon the mortality among the " uninoculated, the 6,103 inoculated should have had " 16½ deaths and not 25, which is a difference in the " mortality of 84 per cent. These results, however, " must be accepted with reservation, as the actual " population of Karachi during the plague is not " accurately known." I have prepared 56 statements which " give particulars of attacks among inoculated " and uninoculated persons residing in houses, the " inmates of which submitted to the operation. The " first 40 show attacks among the inoculated, the rest " among the uninoculated. Forms Numbers 3, 8, 11, " and 45 are cases really occurring in one house. " These, however, have been shown separately, as " different families occupied different tenements of the " house, and the persons were attacked on different " dates."

11,766. Could you give us the cases of Thawar Megji and Mulbai Megji, and also the tables?—" Thawar " Megji and Mulbai Megji, shown in Form 3, were " occupying one ground-floor tenement. They were " attacked five days after inoculation. Rakhia Musa " and Shiva Jiwraj, shown in Forms 8 and 11 " respectively, were occupying the two remaining " adjoining ground-floor tenements of plot No. 74 " A–12, Chandumal Street, Machi Miani Quarter. The " former was attacked 12 days and the latter 11 days " after inoculation. Thus, out of five inoculated " persons who were occupying three ground-floor " tenements of this plot, four attacks, with one death, " were reported. The one uninoculated person residing " with Rakhia Musa escaped. The whole family shown " in Form No. 45, comprising nine members, of whom " one was not inoculated, occupied the two upper stories " of the plot. The uninoculated was attacked and died. " Thus, the whole house comprised 15 members, of " whom two were not inoculated. The 13 inoculated " had four cases with one death; out of the two " uninoculated, one who was attacked died. The " following statement gives full particulars:—

Serial No.	Name.	Date of Inoculation.	Date of Attack.	Date of Death.	Remarks.
1	Thawar Megji	5.5.98	10.5.98	—	Occupied one ground-floor tenement.
2	Mulbai Megji	5.5.98	10.5.98	—	
3	Gulu Ismail	9.5.98	—	—	Occupied one ground-floor tenement.
4	Rakhia Musa	5.5.98	17.5.98	—	
5	Kesarbai Gulu	(Not inoculated.)	—	—	
6	Shiva Jiwraj	6.5.98	17.5.98	19.5.98	Occupied one ground-floor tenement.
7	Basria Ladha	9.5.98	—	—	Occupied the upper two stories of the house.
8	Miriam Basria	5.5.98	—	—	
9	Jana Meher Ali	9.5.98	—	—	
10	Bhanbai Basria	9.5.98	—	—	
11	Kanji Basria	5.5.98	—	—	
12	Ali Musa	5.5.98	—	—	
13	Nathu Musa	5.5.98	—	—	
14	Meher Ali Ladha	9.5.98	—	—	
15	Nenbai Ladha	(Not inoculated.)	18.5.98	18.5.98	

" There is another notable instance of a number of " cases occurring among the inoculated shown in Forms " Nos. 33, 34, and 35 on plot No. 515 E–4, Gopal Street, " Ranchor Quarter. This is a two-storeyed tenement " house with a yard in the centre, open to the sky. " There are five tenements on the first floor and five on " the ground floor. Pirbhu Punjah, shown in Form " No. 33, was residing with two other inoculated persons " in a tenement on the first floor. He was attacked 56 " days after inoculation and died. Manbai Bechar, " shown in Form No. 34, was residing with two others " in a ground-floor tenement. She was attacked 67 days " after inoculation and died. Dewlibai Sundar, Laxman " Hari and Sundar Hari, shown in Form No. 35, were " occupying a tenement on the first floor and a tenement " on the ground floor between them. They are closely " related to one another. Dewlibai was attacked 68 " days, Laxman Hari 61 days, and Sundar Hari 66 days " after inoculation. Out of the three, Laxman only " recovered. On the occurrence of the first case, the " house was evacuated, and those that were inoculated " were sent to a health camp, the rest being segregated. " Manbai, Dewlibai and Laxman were attacked in the " health camp. Sundar Hari, who was segregated on " the occurrence of these cases, was attacked in the " Lawrence Road Segregation Camp. The following " statement gives full particulars:—

Serial No.	Name.	Date of Inoculation.	Date of Attack.	Date of Death.	Remarks.
1	Tulsi Punjah	19.5.98	—	—	Occupied one tenement on first floor.
2	Pirbhu Punjah	21.5.98	16.7.98	17.7.98	
3	Dalu Govind	21.5.98	—	—	
4	Kustur Madowji	12.5.98	—	—	Occupied one tenement on first floor.
5	Manbai Kustur	(Not inoculated.)	—	—	
6	Chichi Kustur	Do.	—	—	
7	Dewlibai Sundar	12.5.98	19.7.98	20.7.98	Occupied one tenement on first floor and one tenement on ground-floor between them.
8	Laxman Hari	21.5.98	21.7.98	—	
9	Sundar Hari	21.5.98	26.7.98	2.8.98	
10	Daya Madowji	11.5.98	—	—	Occupied two adjoining tenements on the first floor.
11	Lowji Daya	12.5.98	—	—	
12	Lakmichand Daya	12.5.98	—	—	
13	Manubai Daya	12.5.98	—	—	
14	Umbabai Daya	12.5.98	—	—	
15	Tribhowan Bechar	12.5.98	—	—	Occupied one ground floor tenement.
16	Jivibai Tribhowan	12.5.98	—	—	
17	Manbai Bechar	12.5.98	18.7.98	23.7.98	
18	Manji Rura	21.5.98	—	—	Occupied one ground-floor tenement.
19	Mungibai Moti	12.5.98	—	—	
20	Pitambar Narsu	12.5.98	—	—	Do.
21	Dewlibai Pitambar	12.5.98	—	—	
22	Poka Pitambar	(Not inoculated.)	—	—	
23	Shivji Daya	19.5.98	—	—	Do.
24	Ranbai Shivji	12.5.98	—	—	

" Thus, out of a total population of 24 persons residing " on plot No. 515 E–4, Gopal Street, Ranchor Quarter, " 21 were inoculated. Among these, five cases with four " deaths occurred. All the three uninoculated escaped. " To consider inoculation on its own merits, the bare " fact of the occurrence of plague among the inoculated " has only been given; all collateral considerations " have been excluded, such as the virulence of the " epidemic at the time of occurrence of plague cases " among the inoculated Khojas shown in Forms 3, 8, " and 11, as well as in other forms, in the Machi Miani " Quarter, and the lingering of the disease among only " one sect of Hindu-Katchi carpenters of the Ranchor " Quarter, shown in Forms 33, 34, and 35."

11,767. In your statement you give several cases where, in the same house, the uninoculated got plague and the inoculated escaped?—There are a few statements like that.

11,768. But you state in your report that the information on this point is rather inaccurate; is it not so?—Yes, I have stated in my report that it is not complete.

11,769. Can you tell us anything about inoculation in disinfecting gangs?—Here is one interesting case given by the Superintendent of the Market and Jail Quarters:—" Among the coolies of the disinfecting " gangs, the results were wonderfully good. Previous " to 5th May 20 cases of plague occurred among these " men, who had been working at a daily strength of " 50–55; on 5th May, 25 coolies and masons were " inoculated by Dr. Kaka at the Khoja Khana, and " on 12th May the remaining 31 were also inoculated. " Of these, one man developed high fever within the " next 24 hours (*vide* Form No. 2), a bubo appearing " on the third day; on the fifth day he was removed " to hospital, where he died immediately after ad- " mission. With this exception there has been no case

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"of plague among the coolies, and this man must have "been in the incubation stage of the disease at the "time of his inoculation. As these men had to work "all day in most highly infected houses in the most "highly infected quarters, the result appears exceed-"ingly good." I say in my Report, "Out of 44 cases "with 25 deaths occurring among the inoculated up to "the week ending 12th August 1898, 14 cases, with "10 deaths, occurred within the first 10 days of "inoculation."

11,770. How do you account for the large number of cases within the first 10 days after inoculation?—Very likely they were in the incubation stage of the disease when they submitted to the operation.

11,771. Is that a very large number in the incubation stage?—The quarter where they resided was very highly infected.

11,772. Have you any experience of people having plague after being twice inoculated?—None whatever. As far as we know there have been none here.

11,773. Is there not another class of Khojas—Pirai Khojas—who were not inoculated?—With the exception of four they were not.

11,774. How many were uninoculated?—The Pirai Khojas themselves comprised 245 souls.

11,775. What was the number of cases among them?—14 cases with 13 deaths.

11,776. Do they belong to the same class of people as the Panjabhai Khojas?—Yes, except that they do not believe in H.H. the Aga Khan.

11,777. You say, in your report, "The total number "of cases and deaths that occurred among the "inoculated Panjabhai Khojas was 20 (nine males and "11 females), and nine (four males and five females) "respectively. Three cases reported during the week "ending 21st October 1898 had occurred five months "after inoculation." You do not include these cases?—No.

11,778. For the same reason that you stated before?—Yes.

11,779. Have you any deaths amongst these Panjabhai Khojas since your report ends here?—I have not inquired about that.

11,780. Could you inquire about that?—Yes, I will inquire. (The following statements were afterwards submitted by the witness):—

GROSS MORTALITY from all OTHER CAUSES among PANJABHAI KHOJAS from week ending 7th October 1898 to week ending 21st January 1899.

Week ending	Inoculated.			Uninoculated.		
	Under 5.	5–59.	60 and upwards.	Under 5.	5–59.	60 and upwards.
7th October 1898	—	—	—	—	—	—
14th " "	—	—	—	—	—	—
21st " "	—	—	—	—	—	—
28th " "	—	—	—	—	—	—
4th November 1898	—	—	—	—	—	—
11th " "	—	—	—	—	—	—
18th " "	—	—	—	—	1	—
25th " "	—	—	—	1*	—	—
2nd December "	—	—	—	—	—	—
9th " "	—	—	—	—	—	—
16th " "	—	2	—	1†	—	—
23rd " "	—	—	—	1	—	—
31st " "	—	—	—	—	1	—
7th January 1899	—	—	—	—	1	—
14th " "	—	—	—	—	—	—
21st " "	—	—	—	2‡	—	—

* Infant of one day old.
† Arrived in Karachi after Khoja's census.
‡ One infant 12 hours old.

GROSS MORTALITY from all OTHER CAUSES among PIRAI KHOJAS from week ending 3rd June 1898.

Week ending	Under 5.	5–59.	60 and upwards.
31st December 1898	1*	—	—

* One infant six days old.

11,781. (*Mr. Hewett.*) I understand you to say that there is no disinfection going on, and that you do not know who passed the order to this effect?—I do not know; it was entirely managed by the Plague Committee.

11,782. What is the position of the Health Officer?—He has nothing to do with the management of plague, so far as he knows, at present.

11,783. Do you believe in the efficacy of disinfection?—Yes, I do.

11,784. You were referring to the mortality in the voluntary camps. I understood you to say that the mortality in the voluntary camps was less than it was in the unevacuated portions of the town at the time; was it so?—No, I did not say that. I said that, comparing the total mortality of the city with the mortality in the camps, it appears that the death rate rapidly goes down in the camps.

11,785. You say you had quarters of the town, the normal population of which is 50,000, evacuated?—Yes, 40,000.

11,786. What was the mortality among the remaining 40,000 during that time?—The quarters are the Old Town, Napier, Market, Machi Miani, and portions of the Lyari. The figures are as follows:—

Week ending	Old Town. 1.		Napier. 2.		Market. 3.		Muchi Meani. 4.		Bunder. 5.		Part of Lyari 6.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
25th March 1898	—	—	—	—	—	—	—	—	—	—	—	—
1st April "	—	—	2	—	2	—	—	—	—	—	—	—
8th " "	2	—	9	6	7	5	—	—	—	—	1	1
15th " "	6	5	25	16	20	15	6	1	—	—	9	8
22nd " "	13	7	54	41	58	45	11	9	1	1	17	9
29th " "	31	23	90	74	65	37	23	14	1	1	43	32
6th May "	100	68	115	98	108	104	31	25	13	10	112	78
13th " "	82	73	71	56	64	46	45	29	10	9	87	72
20th " "	16	22	20	21	23	22	22	22	3	3	95	65
27th " "	3	1	6	4	8	6	3	3	4	3	74	53
3rd June "	1	4	1	2	2	4	3	3	3	2	58	43
10th " "	—	—	—	1	—	—	1	1	—	—	39	21
17th " "	—	1	—	—	—	—	—	—	—	—	23	15
24th " "	—	—	—	—	—	—	—	—	—	—	9	9
1st July "	—	—	—	—	—	—	—	—	—	—	2	1
8th " "	—	—	—	—	—	—	—	—	—	—	2	1
15th " "	—	—	—	—	—	—	—	—	—	—	—	1
22nd " "	—	—	—	—	—	—	—	—	—	—	1	—
29th " "	—	—	—	—	—	—	—	—	—	—	7	5
5th Aug. "	—	—	—	—	—	—	—	—	—	—	2	2
12th " "	—	—	—	—	—	—	—	—	—	—	—	—
19th " "	—	—	—	—	—	—	—	—	—	—	—	—
26th " "	—	—	—	—	—	—	—	—	—	—	—	—
2nd Sept. "	—	—	—	—	—	—	—	—	—	—	—	—
9th " "	—	—	—	—	—	—	—	—	—	—	—	—
16th " "	—	—	—	—	—	—	—	—	—	—	—	—
23rd " "	—	—	—	—	—	—	—	—	—	—	1	1
30th " "	—	—	—	—	—	—	—	—	—	—	—	—
7th Oct. "	—	—	—	—	—	—	—	—	—	—	—	—
14th " "	—	—	—	—	—	—	—	—	—	—	—	—
21st " "	—	—	—	—	—	—	—	—	—	—	—	—
28th " "	—	—	—	—	—	—	—	—	—	—	—	—
4th Nov. "	—	—	—	—	—	—	—	—	—	—	—	—
Total	254	204	393	319	357	284	145	107	35	29	582	417

11,787. Is this plague mortality or total mortality?—Plague.

11,788. How does that compare with the mortality in other quarters?—The other quarters are not so much infected.

11,789. You think that no comparison is possible?—No comparison is possible.

11,790. Do I understand you to say that voluntary evacuation, such as was practised here, was a good measure?—I think so. I will quote one instance from a report* on the first epidemic, submitted to the Karachi Municipality, if you will permit me, about voluntary evacuation and the formation of health camps, as follows:—"Nassarpuri Camp.—It has been already "stated that the Nassarpuri Camp was the first that "was formed, and that every indulgence was shown to "the Nassarpuri sect of Hindus to encourage them to "turn out from infected areas into a healthy encamp-"ment in the Lyari quarter. They were permitted to "remove their sick as well."

11,791. That was a comparatively small experiment in the first place?—Yes, about 2,000 persons.

11,792. You had voluntary evacuation on a much larger scale afterwards?—Yes, but we have no data about that. "Hence on looking at the accompanying "table it will be seen that during the earlier period of "their arrival into the camp, the number of cases "brought to notice was considerable. For easy "reference the weekly number of cases and deaths "that occurred in the Camp have been noted below. "The case shown during the week ending 22nd May "was reported in a Nassarpuri Hindu immediately "after his leaving the Nassarpuri Camp for his house "in the Market Quarter, and is shown as belonging to "this Camp and not the Market quarter.

Week ending	No. of Cases.	No. of Deaths.
January 30th	13	13
February 6th	25	25
„ 13th	7	6
„ 20th	11	6
„ 27th	5	3
March 6th	4	3
„ 13th	10	5
„ 20th	3	3
„ 27th	3	3
April 3rd	5	4
„ 10th	3	3
„ 17th	4	3
„ 24th	1	1
May 1st	1	—
„ 8th	—	—
„ 15th	1	1
„ 22nd	1	1
Total	97	80

"The Nassarpuris fully occupied the huts on 24th "January 1897. The camp was vacated on 15th May "1897 after complete disinfection of the persons and "belongings of the residents, who were then permitted "to go to their houses in the native city. The camp "was divided off at one time into two parts. In the "second portion late arrivals were permitted to reside, "with a view to find out the influence upon the "health of the community produced by such late "arrivals. Owing, however, to very free communi-"cation between the inhabitants, and the sect being "very clannish, no reliable information could be ob-"tained, and in this report the camp is regarded as one. "Ninety-seven cases, with 80 deaths, occurred among "the residents. It must be remembered that 21 cases "of plague were brought from the city to the camp, "and that up to the beginning of March the sick were "living in the same huts with the healthy. The only "measures that were adopted with this community "were the destruction of the huts and infected articles "on the termination of the cases; the healthy were not "segregated till about the end of March. The "Nassarpuris did not bring to the notice of the "authorities the fresh seizures that occurred, till the "rule regarding compulsory notification came into "force. The authorities generally received information "after a death from plague in a hut. Fifty-one cases "were reported during the first 10 days of the occupa-"tion of the camp, *i.e.*, up to 2nd February 1897; out "of these, 21 cases had been brought actually ill from "the city, and 45 died; excluding these 51 cases and "45 deaths from the total seizures and deaths, the actual "number that can be said to have occurred in the camp "is 46 cases with 35 deaths. The population of the "Nassarpuri Camp when it was occupied was 2,500; a "slow and imperceptible exodus went on, and when a "rough census was taken in the beginning of March "the population was found to be 1,200. Dividing then "the seizures and deaths into two periods, and calcula-"ting the mortality of the 45 deaths that occurred "amongst the 51 persons that were seized within the "first 10 days of their occupying the camp on the "population of 2,500, and the mortality of the 35 "deaths out of the 46 seizures on the mean population "1850, the results will be as follows:—

Deaths among Persons that were attacked within the first 10 Days of Occupation of the Nassarpuri Camp.	Population of Camp.	Death Rate per 1,000.
45	2,500	18·00
Deaths among Persons that were attacked after the first 10 Days of the Occupation of the Nassarpuri Camp.		
35	1,850	18·91

"The mortality compares very favourably with the "mortality from plague in the principal quarters of "the native town, viz., Old Town, Napier, and Market "Quarters, and, doubtless, if the patients and residents "of sick huts had been segregated, the results would "have been still more favourable. Contrasting the "weekly mortality from plague in the Nassarpuri "Camp with the mortality in the Old Town, Napier, "and Market Quarters, principally occupied by the "Nassarpuri Hindus during corresponding weeks, the "results will be as follows:—

Week ending	Old Town.		Napier.		Market.		Nassarpuri Camp.	
	No. of Deaths.	Death Rate per 1,000.	No. of Deaths.	Death Rate per 1,000.	No. of Deaths.	Death Rate per 1,000.	No. of Deaths.	Death Rate per 1,000.
13th February 1897	15	81·96	48	292·68	39	302·32	6	3·24
20th „ „	6	32·78	38	231·70	16	124·03	6	3·24

"The mortality among the Nassarpuris is calculated "on the mean population of 1850. It would be less still "if the figure 2,500 were adopted. In working out the "death rates for the Old Town, Napier, and Market "Quarters, the census figures have been employed. "Thus, this first movement towards the formation of "health camps produced a decided improvement on the "mortality from plague. There can be no doubt that "if the Nassarpuris had lived in their insanitary "houses, and not turned out into a healthy encamp-"ment, they would have died at a far higher rate than "in the camp set apart for them."

11,793. Have you any idea when the population of this camp became reduced by more than a half?—By March.

11,794. But at what particular time?—That I cannot tell you; it was slow and imperceptible.

11,795. But the reduction might seriously affect your inferences, might it not?—If you take it at the lowest figure possible, 1,200, it would work out very well.

11,796. Is your experience the same in other camps during the second outbreak?—I think it is, on the whole, satisfactory.

* Not printed with the Proceedings of the Commission.

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11,797. In what way do you think that the good results of voluntary evacuation are produced?—Because you turn them out of their infected houses where they would be more likely to get plague.

11,798. Is it not also a result of voluntary evacuation that you get all the contacts out of the infected area?—Yes, the contacts go out with the people.

11,799. The first case of plague in the second outbreak was found on the 25th of March 1898?—Yes, 25th March.

11,800. And you think that there was nothing in the mortality of the city previous to that to indicate that plague existed prior to that date?—Nothing whatever, so far as I can make out.

11,801. Would you refer to the table you have furnished in your précis of evidence, of the gross mortality in Karachi during the three months before plague was discovered. You say there were 973 deaths in the three months ending the 25th of March?—Yes.

11,802. What rate of mortality, per 1,000, in 12 months does this represent?—About 35.

11,803. The average death rate, from all causes, of the town for the five years ending 1895-96, when there was no plague, was 34·11 per 1,000 of the estimated population, and 37·91 per 1,000 of the census population, was it not?—For the five years ending 1895-96.

11,804. Do you think that during the period in 1898, just before the plague was discovered, a population equivalent to the census population was actually in the town?—I cannot tell you.

11,805. Have you any reason to believe that the population was less than the census population?—I should put it down as the census population—about that.

11,806. Do you think that everybody had come back?—I should say that 95,000 was about the population of the town at the time.

11,807. So that the mortality for the three months before plague was discovered was, in your opinion, only fractionally higher than the average?—I cannot say it is higher. If you compare with the corresponding number of weeks of previous years, it would come to the same.

11,808. Do you think that in this quarter, from January to March, the mortality is usually as high as it is in the autumn?—The mortality of the quarter from January to March, I should say, is certainly higher than the average annual mortality.

11,809. Higher than in the autumn?—The autumn and winter months are the worst in Karachi.

11,810. Do you think that the months of January, February, and March are as unhealthy as the months of September, October, and November?—I should say generally the same.

11,811. Do you feel sure that this case of plague found on the 25th of March was the first one?—So far as we know, certainly.

11,812. You were unable to ascertain how the man got plague?—Quite.

11,813. The table in your précis of evidence, showing the gross mortality in the city of Karachi, from April to November 1898, shows that only 67 children under the age of five died of plague in that period?—Yes.

11,814. Can you account for the very small mortality among the infants?—So far as my experience goes, children are less susceptible to plague than adults.

11,815. Can you give us any reason for that?—Take, for instance, the mortality under one year of age in the first epidemic of 1896-97; you will find that, practically speaking, the death rate from plague is infinitesimal. In that epidemic there are only 46 cases with 39 deaths recorded. In the second outbreak, I know of only four cases with two deaths, among infants under one year of age.

11,816. Can you give any explanation which will account for that?—I cannot.

11,817. It was stated in evidence by Lieutenant Cornwall that, as the result of the first outbreak of plague here, a large number of children was left on the hands of the authorities, and that there was a large mortality among infants after the first epidemic of plague; can you tell us if that is true?—The infant mortality of Karachi is always very high.

11,818. Can you tell us whether it is a fact that after the first epidemic of plague there was a very serious rise in infantile mortality?—I cannot tell you now. I will look up the figures and furnish them. (The following figures were supplied later by the witness):—

Years.	First Quarter.				Second Quarter.				Third Quarter.				Fourth Quarter.			
	Hindus.	Muhamadans.	Parsees.	Christians.	Hinhus.	Muhamadans.	Parsees.	Christians.	Hindus.	Muhamadans.	Parsees.	Christians.	Hindus.	Muhamadans.	Parsees.	Christians.
1896 -	421	321	200	125	332	288	371	277	294	266	157	147	231	262	285	179
1897 -	370	237	458	90	359	199	272	266	476	428	500	285	397	368	111	125
1898 -	357	282	66	421	409	319	83	125	291	332	66	291	233	233	71	156

11,819. (*The President.*) Could you state the ordinary mortality among children in the several years?—The ordinary infantile mortality is as follows:—

Years.	Hindus.	Muhamadans.	Parsees.	Christians.
1894-95 -	313	293	285	255
1895-96 -	334	287	384	244
1896-97 -	291	264	350	168
1897-88 -	400	315	244	263

11,820. (*Mr. Cumine.*) When the first epidemic was expiring, did it cling with persistency to any one caste?—I did not notice.

11,821. You stated, I think, in answer to one of the Commissioners, that one of the advantages of the voluntary camps was that it enabled you to get all the contacts?—Yes.

11,822. Did you take the contacts in the voluntary camp?—Yes. They were allowed to go. They do go out now; there is no compulsory segregation at present. Everybody goes out into encampments.

11,823. But when a case of plague occurs in a voluntary camp, do you take the contacts into segregation?—I think Dr. Seymour will be able to answer that question better than I can.

11,824. You gave us certain figures of attacks and deaths of all the camps for the week ending 6th May, and so on. Are those for all the voluntary camps only, or do they include segregation camps?—Voluntary camps only.

11,825. You yourself have no actual experience of the number of deaths in the voluntary camps and were not in charge of them?—No.

11,826. I should like to have a statement showing by castes the attacks and deaths in the ast six weeks of

the first epidemic. I want to see what the castes were in which the epidemic was most prevalent towards its close?—A general statement for the whole period of the first epidemic was compiled by me as follows:—

The following STATEMENT gives the NUMBER of CASES and DEATHS classified according to CASTES with other particulars. The Statement only applies to Municipal limits as the caste figures for Cantonments are not available. The mortality is highest among Hindus and lowest among Parsees. Among Europeans, only two cases were reported in female children of the ages of nine and four, both of whom died. One was born in Burmah, the other in Calcutta.

Castes.	Number of Male Cases.	Proportion of Attacks to Population.	Number of Male Deaths.	Proportion of Deaths to Population.	Case Mortality.	Mortality per 1,000.	Number of Female Cases.	Proportion of Attacks to Population.	Number of Female Deaths.	Proportion of Deaths to Population.	Case Mortality.	Mortality per 1,000.	Number of Total Cases.	Proportion of Attacks to Population.	Number of Total Deaths.	Proportion of Deaths to Population.	Case Mortality.	Mortality per 1,000.	Proportion of Male Cases to every 100 Female Cases.	Proportion of Male Deaths to every 100 Female Deaths.
Hindus	1,172	1 in 21	965	1 in 26	82 p.c.	37·53	688	1 in 23	584	1 in 27	84 p.c.	35·80	1,860	1 in 22	1,549	1 in 27	83 p.c.	36·86	170	165
Muhamadans	1,166	1 in 24	942	1 in 30	80 p.c.	32·82	880	1 in 25	725	1 in 31	82 p.c.	31·97	2,046	1 in 25	1,667	1 in 30	81 p.c.	32·43	132	129
Parsees	5	1 in 144	3	1 in 240	60 p.c.	4·16	7	1 in 89	4	1 in 157	57 p.c.	6·36	12	1 in 112	7	1 in 192	58 p.c.	5·9	71	75
Christians	27	1 in 75	14	1 in 145	51 p.c.	6·85	9	1 in 101	6	1 in 139	72 p.c.	7·15	36	1 in 83	20	1 in 148	57	6·96	245	174
Europeans	—	—	—	—	—	—	2		2			—	2		2					
Other Castes	77	—	47	—	—	—	36	—	—	—	—	—	113	—	73	—	—	—	—	—

11,827. That does not show in what castes it lingered to the end. It is the first epidemic I particularly want to know about—a statement showing by castes the attacks and deaths in the last six weeks of the first epidemic. And please mark specially the castes of the children under five that died?—(The following statement was afterwards supplied by witness):—

STATEMENT showing by CASTES the ATTACKS and DEATHS during the last six Weeks of the first EPIDEMIC of PLAGUE classified according to AGE GROUPS.

Week ending	Hindus.										Muhammadans.										Grand Total.	
	Under 1 Year.		1–4.		5–59.		60 and upwards.		Total.		Under 1 Year.		1–4.		5–59.		60 and upwards.		Total.			
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
24th June 1897	—	—	—	—	—	—	1	—	1	—	1	—	—	—	3	2	—	—	4	2	8	2
1st July „	—	—	—	—	1	1	—	—	1	1	—	—	—	—	1	1	—	—	1	1	2	2
8th „ „	—	—	—	—	—	—	—	—	—	—	—	—	1	1	1	2	—	—	2	3	2	3
15th „ „	—	—	—	—	2	2	—	—	2	2	1	—	—	—	—	—	—	—	1	—	3	2
22nd „ „	—	—	—	—	2	1	1	1	3	2	1	1	—	—	2	1	—	—	3	2	6	4
29th „ „	—	—	—	—	1	1	—	—	1	1	—	—	—	—	1	—	—	—	1	—	2	1

11,828. (*Mr. Hewett.*) On page 4 of your published Report* on Plague in Karachi in 1896–97 you say:—"Taking a lesson from Bombay, I am strongly of "opinion that the Municipality should enforce compul-"sory segregation of all cases." Do I understand that you have modified that opinion?—Yes; I have modified my views since.

11,829. (*The President.*) You spoke of 1,500 people as being the limit of a segregation camp?—The present accommodation was for 1,500 people.

11,830. Did you think that above that number would be inconvenient?—It would be convenient; there is plenty of room. More huts could be run up, but the question of funds has to be considered.

11,831. Is there any limit at all? You could accommodate a very much larger number in a segregation camp. I suppose there is no limit except physical conditions?—There is no limit. The conditions are favourable to segregation.

11,832. Have you many cases here in which inoculation has been twice performed?—None, so far as I can make out.

11,833. What were the times of the occurrence of plague? Did you notice any relationship with the meteorological conditions?—I did not seek for those.

11,834. You have no observations upon that subject?—None, beyond what has been stated by me in my report* to the Municipality, in which I have given a statement showing the daily temperature and rainfall from December 1896 to June 1897, but have remarked that it is very doubtful whether the weather produced any influence on the progress of the epidemic or on the disease itself.

11,835. What is your opinion as to the part rats play in the propagation of an epidemic?—I have seen them generally precede an outbreak in a house. I know of one particular instance where rats were found, and the people were sent to the segregation camp, and one of the persons developed plague there. I have the history of the whole case here. I took a particular note of it. A man of the name of Nanoolmul Pirdhanmal, aged 52, a Hindu merchant, born in Karachi, was segregated in the Lawrence Road Camp on 19th April 1898, because dead rats were found in his house. This man developed plague on the following day, and died in the Civil Hospital.

11,836. Had you excluded infection from any human source in that case?—There were no cases in this particular house. I inquired particularly about this case. There was no sickness amongst his relations, or in his own house. Simply because rats were found he was sent into the camp.

11,837. There were cases in the town; it might have been from them?—Yes; possibly.

11,838. Did you observe that cats were affected?—Yes. I had three or four.

11,839. Did they die of plague?—I cannot tell you They had swellings in the neck.

11,840. Glandular swellings?—Yes, glandular swellings.

* Not printed with the Proceedings of the Commission.

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11,841. Was any bacteriological examination made?—No.

11,842. Were there many deaths among the cats?—I have seen three or four.

11,843. I understand you have killed off a large number of cats?—Yes.

11,844. So that they did not have a fair chance of taking plague?—In the first outbreak they had.

11,845. Did you make careful inquiries into this first case that has been referred to in the first outbreak?—I did.

11,846. Will you tell us what you found?—The first case was brought to notice on 10th December 1896, in the person of a Hindu Brahman, who was said to have been taken ill about the 6th of that month, in a house in Rampart Road, Bunder Quarter. From here he was apparently removed, by some one who knew what the patient was actually suffering from, to a house in the Runchor Quarter of the City, thus strengthening the expressed opinion that the disease was imported from Bombay, where it made its appearance about September 1896. On 11th December 1896, a case was reported from the Old Town Quarter, and gradually the number of cases that came to notice increased till the disease laid a firm hold of the city, raging in the form of an epidemic and causing a panic among the populace.

11,847. Why do you say that that started it, that it came from Bombay?—The people knew what he was suffering from, and removed him. They took him to a lonely house in another quarter of the city.

11,848. Can you tell me the nature of the habitations in which plague chiefly occurred?—They vary; chiefly low, damp, dirty, and ill-ventilated places.

11,849. I see you made the statement that the one measure which has proved successful in combating plague is the compulsory evacuation of infected areas?—Yes.

11,850. Do you still adhere to that opinion?—Yes, I do.

11,851. You also made a statement to the effect that, where sanitary arrangements are good, plague does not assume a virulent form?—Yes.

11,852. Do you still adhere to that opinion?—Yes.

11,853. (*Dr. Ruffer.*) Could you give us the mortality from other causes in the inoculated, not counting the Khojas?—It could be done, it is a question of time.

11,854. I should be glad if you would give us that information?—(Note, added by witness on correcting proof of his evidence:—This information, I am sorry to say, cannot be furnished.)

11,855. What systems of inspection had you got in your voluntary camps? How did you know the number of deaths, for instance?—Dr. Seymour can answer that better than I can.

11,856. Have you any idea of what is the number of children under five years of age in Karachi?—The population of 1891, according to the census figures, contained 13,218 children under five.

11,857. When you say that you believe in compulsory evacuation, you mean wholesale voluntary evacuation?—Yes, voluntary.

11,858. (*The President.*) You believe in evacuation?—Yes.

11,859. Whether voluntary or not, you think there should be evacuation?—Yes; but the evacuation of one house would not check plague in the adjoining houses.

11,860. Your answer refers to the evacuation of infected areas?—Yes, infected areas.

11,861. (*Mr. Hewett.*) To make evacuation effective, do you think that you must get hold of all the contacts?—Yes. Contacts or not, they all came in, but we did not restrict their movements.

(Witness withdrew.)

Mr. W. L. Seymour.

Mr. W. L. SEYMOUR called and examined.

11,862. (*The President.*) I understand that you are a member of the Royal College of Surgeons, and a Licentiate of the Royal College of Physicians?—Yes.

11,863. You hold some offices in connexion with plague work, do you not?—I was first of all in medical charge of the voluntary camps. When the Superintendent was unable to continue, I was also in administrative charge as Superintendent of the division, as well as in medical charge.

11,864. At what time was this?—I was in medical charge from May 7th to August 11th of this year.

11,865. (*Mr. Cumine.*) It is on the second epidemic you are prepared to speak, I believe?—Yes.

11,866. Your acquaintance is especially with these voluntary camps?—Yes, entirely.

11,867. Would you tell us in what the voluntariness of a voluntary camp consists?—It consists in allowing the people to settle within a definite area, where they like to arrange their houses. At first they were allowed to arrange them as they liked. Subsequently we took care to insist upon the streets being broader, and there being more ventilation. Thirdly, we made them arrange for the sanitation of the streets, and of their own accord isolate the sick in their own huts, and segregate the relatives. There was to be no interference with them if these conditions were fulfilled.

11,868. Were there any other conditions?—No; the three conditions were that they were to be allowed to settle where they liked within this area, that they were to keep the place clean, and isolate the sick and segregate the contacts.

11,869. Where is the area assigned for these voluntary camps?—I can give you the boundaries. Two miles north of Magar Pir, on the south the Lyari river, on the west the new road leading to Magar Pir from Karachi, on the east the station of Thul on the railway.

11,870. Were all the voluntary camps under you?—No. I had 44 camps under me. The rest, on the east of the Magar Pir road, were under the charge of Sirdar Muhammad Yakub, a Muhammadan.

11,871. Had the people in the camps under your charge come from any particular portion of the town?—They had come from various portions of the town, from the Joria Bazar, from the Market Quarter, the Gaol Quarter, and from the Rambagh Quarter.

11,872. They had not all come from one or two quarters alone?—No, some from the Sudr Bazar.

11,873. Were they all Hindus, or all Musalmans, or mixed?—We had one camp of Punjabis, one camp of Hyderabadis (people belonging to Hyderabad), and we had one camp of a caste called Serais—also Hindus. Then we had two camps of Khojas, and a camp of Memons—Muhammadan traders.

11,874. Did the people all move from the town into your voluntary camps at once, or did they keep coming in in detachments?—When I took over charge a great number were already there, but subsequent arrivals took place. As the people feared the plague, and also heard from these others that they were pretty comfortable out there, there, they began to come out in large numbers.

11,875. At what date did they begin to come out there, and at what date did they begin to go back to the town again?—I know they were there in April; but I did not take charge till the 7th of May.

11,876. When did they go back again?—Between the end of July and the end of August; some a little later.

11,877. Had you any census or roll-call? How many people did you have in your voluntary camps?—I had a census taken myself of every village. It gave 12,650 people of all the different castes. Of course they kept coming more and more. There might have been 13,000 in round numbers, but 12,650 we took by the house to house census.

11,878. Did you have any daily roll-call?—The people were scattered in 44 villages.

11,879. You had none?—No.

11,880. Were the people free to go to the town or to their work in the day time?—Quite free.

11,881. Were they free to absent themselves at night also, if they chose?—I believe it depended upon the Plague Superintendents in Karachi whether they allowed them to sleep on their premises.

11,882. Could you tell us what the arrangements for food and drinking water were?—In most of the camps there were one or two Banniah's shops generally at the extreme limit of the camp. There was no attempt at anything like a bazar. There was nothing like actual trade or business going on inside the camps.

11,883. What were the arrangements for the security of property?—At first we had one policeman for two camps if they were fairly near, and the people used to appoint one or two of their own men to patrol at night, but they subsequently, towards the end when a great many thefts took place, applied for more police, and we put more police in each separate camp.

11,884. What system of sanitation was adopted?—We used the narrow trench dry earth system of sanitation enclosing with matting and with compartments. Subsequently we filled with earth, and removed the whole of the sanitary arrangements some hundred yards or so in another direction.

11,885. Was any attempt made to disinfect the goods of the people before they entered the camp to live?—No.

11,886. How did you hear of any plague cases that occurred in the camp? Did you search from hut to hut yourself?—We did not at the very commencement, —when I first had charge we did not. But we did get information that some cases were being concealed, and after that we inspected the camps twice a week.

11,887. What was the theory—that the people would do the reporting themselves?—Yes, they would put the sick out. It would be apparent from the sick huts.

11,888. Will you explain about the sick huts; what were they?—The people placed outside their villages certain mat huts for the sick people, and certain huts for segregation purposes. They undertook of their own accord to place the sick there—place them in these huts. But we found out they were not doing it in one or two camps. We found three or four cases, and we made inspections twice each week. By degrees the people themselves thought that it was not any use concealing the cases. There was no particular terror; they found they were not oppressed in any way if they took their sick there, and afterwards they used to put their sick out. We had no more trouble from that time.

11,889. Did you find that most of the cases that occurred in camp were traceable to infection incurred by people going into the town?—Yes. The people who went into the town came back ill, a man came back ill, and the next day we were told that he had plague.

11,890. When such cases occurred in camp did you find it spread to other people in the camp?—I think in one or two cases the children caught it, because we had some cases of children under two years of age, which is rather unusual with plague. I think they caught it simply from the fact of the parents going backwards and forwards from the town.

11,891. Did other adults seem to catch it much?—No, we had no spontaneous cases, no indigenous cases.

11,892. Sometimes five or six people will die of plague in one house in a town. Did you find five or six cases occur in one hut in these voluntary camps?—No, I do not remember more than one.

11,893. Could you give us a statement of the total attacks and mortality in the voluntary camps—by months?—From the 1st of May there were 149 cases and 128 deaths. In June 47 cases and 38 deaths. In July 11 cases and 10 deaths; and up to the 4th August one case and one death.

11,894. When a case of plague occurred in a voluntary camp what was done with the contacts? Did the people isolate them?—Yes; they used to put them into separate huts, which we called segregation huts. But we found afterwards that in the open village there was no possible means of checking their remaining in these huts. We knew that they did go back in the evening to their houses, and take sick persons back to their houses, and bring them back into the tents in the morning before we came round. That, however, did not often happen. It was found out by accident. I happened to go to a case at 11 o'clock at night. I passed by one of these mat huts in which there ought to have been a child who had plague. I found that hut empty; I found that the child was back in its family's hut. That only occurred twice. The people in the far off camps used to mix freely with plague patients; they used to go and talk with them. If I were seen coming, there would be a general scuttle back to the houses. It did not seem to cause any infection. I think the hygienic conditions so much more favourable out in camp; and the people themselves were not under the dread of death as they were in the towns. I think those facts helped.

11,895. Did you see what was done with the clothes and bedding of the people who died of plague?—We burnt them.

11,896. You were particular about that?—Yes, always.

11,897. Did you keep a record which would show us to what extent cases of plague had occurred amongst the people in these voluntary camps within ten days of their arrival from the town in the camp?—No; I could not get you the information.

11,898. Have you anything to say regarding the apparent varying liability of Hindus and Musalmans to plague infection?—Yes; it was noticed in the case of Muhammadans, who were well fed like the Memons of the Sadr Bazar; in fact during the whole time I was there no case occurred in their camp. One case occurred previous to the three months I was there; but none occurred amongst them. On the bank of the Lyari there was a camp of Baluchis. They were very miserable individuals, men of very inferior physique, who lived on just a little fish, very often raw, and a little bread. These people had a great many cases amongst them—a very great number. The other Muhammadans had a very few cases. Altogether there were far fewer Muhammadans attacked than Hindus.

11,899. In so far as the people were allowed to go into the town when they chose, the evacuation can hardly be said to have been complete evacuation, can it?—Certainly not.

11,900. It was suspended partially in so far as these people were allowed to go back?—Yes, exactly; it was partial and permissive.

11,901. Do you claim for a partial evacuation of this sort that it stops plague, or merely that it reduces the number of attacks among the people who go to live in these voluntary camps?—I think it reduces the number of attacks. It must be from the fact of the healthier surroundings and the absence of terror—I think it must undoubtedly. Besides, I noticed that as a rule the plague we met with in the camps was not as virulent as that met with in the city.

11,902. But you do not claim for it that it completely stopped the plague within 10 days?—It might as far as the people who are concerned, who are outside in the camps; but as far as I have noticed in the previous epidemic it is only when the houses are evacuated entirely and left empty for something like six weeks that it seems safe for people to go back again with no danger of infection—as was the case in Kotri.

11,903. Will you tell us whether the result of the voluntary camps, this modified evacuation, was generally good or bad?—Excessively good, I think; very efficacious. First of all, it meant co-operation with us—I mean as Government officials—in a scheme which we wished to carry out. There was no pressure on the people. It was simply explained to them that if they did go out we were not going to force them into a segregation camp which they so much disliked, that we would allow them to be perfectly free. We told them that they might look after themselves *entirely*. Then again, they were very glad to run away from the place while the plague was there and go where they were not interfered with and would not be bewildered with measures they did not understand. They seemed to be very contented indeed.

11,904. Did you attempt to treat the sick people in the voluntary camps?—Yes. At first they were very prejudiced against taking medicine, as they are always. As a medical man I had been treating them for all forms of ailments. I fancy that, being accustomed to my presence, they partly got more confidence. Then they got more and more enterprising with regard to treatment; and as they recovered they introduced others, until in the months of July and August the people used invariably to send for me for the plague cases.

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11,905. Is there any particular form of treatment which you have found successful here?—Yes, a combination of internal antiseptics, carbolic and quinine. I found that carbolic, given in very large doses, comparatively speaking, had a very marked effect. Where the plague was only of a very few days' duration, sometimes, after three doses of that combination, the temperature fell by 2 and sometimes by 3 degrees. I found, subsequently, whenever the temperature did fall after a course of this antiseptic treatment it never again rose; the patient was, to all intents and purposes, safe. We had no rise of temperature whatever again. We very often had a subnormal temperature of 96 for some days, and then it was necessary, of course, to keep the heart going, to support the patient, but never did he get any more symptoms of plague; they continued to subside.

11,906. Can you tell us the rate of mortality amongst the people you thus treated?—I found a number of cases in which the treatment was refused: there were 388 of those, of which 303 died and 85 recovered. Of those which received indoor treatment, where we could secure the medicine being continuously given at the right intervals, there were 36 cases, 9 deaths, and 27 recoveries. In outdoor treatment, where it was impossible to insist on the medicine being given except we were present, there were 29 cases, 12 deaths, and 17 recoveries. The percentages read:—Treatment declined, percentage of recoveries, 21·9. Treatment received (indoor); percentage of recoveries, 75. Treatment received (outdoor); percentage of recoveries, 51. The effect of treatment was very marked as far as statistics show, and the people became very willing to adopt this treatment subsequently.

11,907. Have you any notes here which you would like to read to us?—As regards the medical treatment, by far the best result obtained by myself was from the external and internal use of antiseptics. The strychnine and diffusible stimulant treatment was at first tried, but without satisfactory results. Doubtless a cardiac tonic like strychnine and diffusible stimulants —ammonia and brandy—are invaluable as adjuncts to any treatment for plague on account of the great danger of sudden cardiac failure; but a system which aims merely at maintaining vitality until the poison shall have abated its virulence by diffusion, excretion, and elimination, whilst admittingly failing to affect in any degree the nature, course, or effect of such poison, must be as unsatisfactory as it is unscientific. Of course, I am aware that treatment by internal antiseptics has often been tried, but it is rather in the combination of such antiseptics that success apparently lies. Some 15 years ago Surgeon Captain Holmsted, now Surgeon-Major, retired, whilst Civil Surgeon of Hyderabad, conclusively showed that a combination of quinine with carbolic acid was far more efficacious than either drug singly, in malarial fevers of all kinds, as well as in conditions due to impurities or poisons in the circulation. I have personally verified his conclusions by my extensive use of this combination during my tours in the districts. The medicine is in the following form in the plague:—

Acid. Carbol: Liq.	-	M. II.
Quininæ Sulph.	-	Gr. V.
Acid Sulph. Dil.	-	M. X.
Glycerini	-	M. X.
Aqua	add ʒ	I.

every four hours. When the fever is very high I give double doses for the first two doses. If I use liquid carbolic acid, 90 per cent., I give two minimum doses of sulphate of quinine 5 grains. If I use pure carbolic I give phenol in pills 2 grains and 2 grains of quinine in each pill. The effect on the temperature is very marked, a fall occurring frequently of 3 or 4 degrees after the same number of doses. The gland wherever situated is kept saturated with carbolic oil 1 in 20 on lint, and if it has not already proceeded to suppuration it gradually subsides to complete disappearance. Where it is evident that the gland has suppurated, or where there is very severe pain or tension, I have found incision beneficial. My own experience is to the effect that this external treatment is much more beneficial than that of the application of extract of belladonna and glycerine. The change in the consistence of the inflamed gland to the touch after the carbolic application for a few days is most noticeable. I can only point to the very large number of recoveries (75 per cent.) of indoor patients in favour of an extended trial of the treatment described. Pills of carbolic and quinine are more portable, but are, naturally, less rapid in effect.

11,908. By indoor and outdoor treatment do you mean, on the one hand people treated in your hospitals, and on the other, people who lived in their own huts?—We had some hospital sheds, but in only one village did we actually utilise it as a hospital. The second place was used for the Hospital Assistants' quarters, because people said they preferred to put up their own huts.

11,909. Is there anything you would like to add to your evidence?—I should like to say that I have never seen a symptom of carbolic acid poisoning in the course of the treatment.

11,910. (*Dr. Ruffer.*) Did the people in your voluntary camps come from Karachi?—All of them were from Karachi.

11,911. What is the largest voluntary camp you formed?—I think it was the Cutchi camps. There were two large Cutchi camps, and a very large camp of Baluchis. The village of Baluchis just opposite the Lyari Bank contained 2,851 people; that was the largest village of all.

11,912. How many cases of plague did you have in that camp?—I have them in my notes under the separate heads of "treated" and "untreated"—61 cases in a period extending over three months from the 7th May till the 11th August.

11,913. Are these camps entered on the list handed in by Dr. Kaka?—These returns were all sent in to the Municipality, so that he would have the figures of them.

11,914. Are they in Dr. Kaka's list?—I do not know.

11,915. Could you make a list showing the number of people in the evacuation camps, the time they stayed there, and the mortality among them, and the time during which the plague lasted in the camp?—Yes.

11,916. You have got the data?—Yes.

11,917. Separately for each camp?—Yes.

11,918. Perhaps in the first month you could give us the number of the first 10 days, and the number afterwards?—Yes, I will do it. (The witness subsequently intimated that the information asked for was not available.)

11,919. How do you know when a certain block was evacuated that all the people went into those voluntary camps?—I did not evacuate at all; I simply received the people into my camp. I did not know anything about how they left or what part they came from, except that I knew they came from a certain direction.

11,920. Was a list given you of the number of people you were to inspect from a certain spot?—No, if a plague patient escaped we got a notice sent round to look out for him.

11,921. Were you not informed that a certain number of people would arrive from a certain block of the town?—Yes, but I did not keep any check. We had certain additions every day to our village.

11,922. You did not know how many you were to expect?—No.

11,923. So that a certain number of people may have gone away?—Do you mean they may have escaped beyond the bounds of these 44 villages.

11,924. They may have gone away to some other village?—They had no choice. They had only the choice of going to the voluntary camps on this side of the road or on the other side of the road.

11,925. How do you know they all came to your camp?—I cannot make out where they could go to if they did not come.

11,926. Have you any evidence to show that they all came to your camps when they left their houses in the evacuated block? What prevented them from going to another part of the town?—I know nothing except that they came into my camp. I do not know whether they were lost on the way or not. They evacuated themselves and came of their own free will.

11,927. You said you noticed a diminution of the virulence of the plague in these villages?—I think so.

11,928. Can you give us any facts concerning this? Have you any statistics?—No. It was my impression medically, from seeing the symptoms, that the better

conditions of sanitation and health in the open country acted in a way to make the form of the plague rather milder.

11,929. But you have no statistics?—No.

11,930. (*The President.*) How often did you give this medicine?—Every four hours.

11,931. How long did you continue it?—Until the temperature fell. The temperature would very often fall within two or three days. In one case, a case of very bad gland indeed in the neck, the temperature remained for three days at 103, then it fell to 101, and went continuously down, and then the glands disappeared without suppuration, simply from the continued application of carbolic oil 1 in 20.

11,932. What is the longest period in which you continued the four-hourly administration?—We found that the neck glands were the most fatal cases. The woman who had the glands in the neck had two of these pills every four hours for three days; that is to say, 12 grains of carbolic acid and 24 grains of quinine in the 24 hours—three times in the day, and three times in the night. She took them for three days continuously, and after that, as soon as the temperature had fallen, I gave the pills to her only during the daytime, and only one pill at a time.

11,933. How long after that?—I think the carbolic was continued for seven days in small quantities.

11,934. You had no bad effects?—No, except in a child of nine years old to whom I gave one drop of liquid carbolic. The temperature went down after three doses from 105 to 99, but the next day the father came and told me the temperature was up again to 105. I have noticed that in the treatment of children it causes a little gastritis. The gastritis yielded to treatment by castor oil and opium. The child made a complete recovery.

11,935. Was the colour of the urine changed?—No.

11,936. (*Dr. Ruffer.*) Were the corpses inspected in your camps?—Yes.

11,937. Was every corpse seen?—Every corpse which had not been under treatment. If a death occurred of a person who was a plague patient and under treatment, we did not inspect the corpse, but in the case of people dying from other diseases, we saw every corpse.

11,938. (*Mr. Cumine.*) Did the people who came to your voluntary camps do so because they were sent by the authorities, or did they come of their own free will?—As soon as it became known that they were at liberty to come across the Lyari and squat down where they liked, they came of their own free will. They were not driven to it. Those who were driven away, I believe, were sent to the segregation camps—those who were compelled to leave their houses—but the other people were told that if they went of their own free will within a certain time, they would not be interfered with in any way.

11,939. So that the question of escape would not come in?—No, the people voluntarily left the place.

(Witness withdrew.)

Lieut. C. A. LAW called and examined.

11,940. (*The President.*) You are a lieutenant in the Wiltshire Regiment?—Yes.

11,941. (*Mr. Hewett.*) You have been in charge of the detention camp at Kiamari?—Yes.

11,942. Were you employed in Karachi during the first epidemic?—Yes.

11,943. For what period?—From March 25th till August 17th, 1897.

11,944. The plague was not virulent except during the earlier period of your employment, was it?—No; it was pretty bad in March and April, and then after that it died out in May and there were only a few cases. In August there were practically none at all—July and August were practically clear.

11,945. Please tell us what your duties were?—My duties first of all were with the search parties and then I went down for about three weeks to the Rambagh Garikhatta to learn the work, and became Plague Superintendent in the Runchor lines.

11,946. In what months were you with the search parties?—About 10 days in March.

11,947. With men of your own regiment?—Yes.

11,948. When you were superintendent in the Runchor lines, what were your duties?—I had the whole of the general plague work; I had to discover plague cases as far as possible. All cases had to be reported to me. I had the whole pass work to do; nobody was allowed to occupy houses without getting a pass-permit, or to go into another division without getting a pass. I inspected every single house in the division and saw if they were properly whitewashed or not. We had them all limewashed. I had the whole conservancy of the division.

11,949. Can you tell us how many houses there are in the Runchor lines?—I am afraid I cannot.

11,950. Did you rely upon a native agency for the reports of cases of plague?—No, I had 14 soldiers. They were divided up. There were four men who each had a quarter of the division, and they used to go about the streets; they got to know the people very well and got information in that way.

11,951. How many cases of plague were reported to you while you were there?—I think about 250.

11,952. What did you do when a case of plague was reported?—I went to see the case, and if it seemed to be a case of plague I used to send the patient off either to the Civil Hospital or one of the other hospitals. I had a hospital at the Runchor lines myself—there was a private hospital there. As soon as the patient was sent off we got the contacts on either side. We usually took three houses, except in cases where the people were of different castes and were not likely to have any connexion with each other. The general rule was to take three houses. Occasionally I turned out the whole compound.

11,953. How many contacts did you get to every case?—Roughly, about 20, I suppose.

11,954. That is from the three houses?—Yes.

11,955. Did you have any cases in which the body of the person who died had been clearly placed in another house to that in which he had died?—Not in the Runchor lines; I did in the Rambagh. There was a case of the Memon found in an outhouse of the Masjid there. He said he had lived there for 20 years, but it was obvious he had not, because there was no roof to the place.

11,956. Was he suffering from plague?—Yes. He died that evening, I think.

11,957. You did not find that dead bodies were placed in other houses to prevent the contacts from being discovered?—No.

11,958. What did you do when a number of cases appeared in a particular compound or line?—When several cases occurred in any particular compound or line, the whole compound was evacuated, the houses unroofed, and the whole place thoroughly disinfected, special attention being paid to the latrines that were used by the victims. The latrine was undoubtedly the cause of infection in several instances. One case I remember in particular—one compound, where the persons attacked were first two Parwaris, and then after eight days a Pathan boy and a Brahman woman. The only connexion between these cases was the latrine This particular compound was an instance of the evil caused by insufficient sanitation. The houses each drained into a wooden tub sunk in the earth. This had got absolutely rotten, with the result that the whole soil was saturated with sullage water, and the smell when some of these places were opened was quite overpowering. The inmates were all removed to a health camp, the whole place thoroughly disinfected, a pucka system of drainage put in, and windows to admit a through current of air knocked in in all the houses. After the whole place had been thoroughly cleaned and whitewashed, the inmates were permitted to reoccupy it. There were no further cases of plague among them after they had been 10 days in the health camp.

11,959. Did you do this in other cases as well?—Yes, that was done certainly in two other cases.

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11,960. With the same result?—Yes; there was never any other case of plague after reoccupation, and no case of plague after the people had been at least 10 days in the health camp. As a rule, plague ceased altogether three or four days after they got into the health camp.

11,961. Have you any cases in which plague developed in a compound after a very long interval had occurred without a case?—Yes; there was one very curious case at the end of the outbreak in 1897 in July. There were no cases among the Mahrattas in the town as far as I could make out for some time previously, and there did not seem to be any reason for it at all. The only reason I could get at was that about three months previously there was a case of plague in this compound about eight houses off, and this man was a relation of the other case, and he confessed to me that he had got hold of some of the previous man's kit, and that a short time before he had opened the first man's box in which his kit was lying and taken out some of the clothes.

11,962. Do you think that this man might have been in communication with anybody suffering from plague at the time?—I cannot exclude that possibility, but there were very few cases in Karachi, and no cases among his own people at the time. It was one of the last cases in the place.

11,963. In what month did it occur?—It must have been in July 1897.

11,964. During the second epidemic, were you employed at similar duties?—Yes.

11,965. Where?—At Kiamari.

11,966. Can you tell us the population of the place?—No.

11,967. Did you treat the people there in the same way as in the first outbreak?—Yes; I turned out more people.

11,968. You did not resort to voluntary evacuation?—No.

11,969. There is a health camp, I think, at Kiamari?—Yes. In 1897 the whole of the old village was turned out and the inmates put into a Government health camp there. Kiamari village almost consists of this health camp. There were only three cases of plague in the health camp. One of those was a wandering Banniah and another was a wandering milk seller. It never spread at all.

11,970. How many cases occurred in your division during the second outbreak?—About 60.

11,971. What sort of houses did they occur in?—There were some old lines there, pucka-built, but very badly ventilated indeed. A dead wall ran through the middle, and there were rooms on each side. There was no possibility of any free passage of air. When you went inside in the early morning the smell was very bad as a rule. Some of them were made of old punkhas, which were absolutely black and smoke-begrimed. Directly we got cases they seemed to spread like wild-fire.

11,972. Did you permit these people to reoccupy their houses after disinfection?—No; The only ones reoccupied were Customs lines after ventilation was done.

11,973. Do you know any instances of houses disinfected in the second outbreak in which subsequent cases of plague occurred?—None in Kiamari at all.

11,974. Did any facts regarding mortality among rats come under your observation?—Very noticeably. At the very beginning of the outbreak, when we had about three cases of plague, we noticed a lot of dead rats in the railway godowns. I had the whole place dug up and disinfected. Shortly afterwards one of the men who worked as a signalman on the railway in these godowns, but usually went up to Karachi at night, and slept in a railway waggon there, got plague. After that, plague seemed to run in blocks, and wherever we found cases of plague we found dead rats.

11,975. Was this man the man whom the Civil Surgeon describes as having picked up a dead rat?—I do not think so.

11,976. Had you any experience of mortality among rats in the Customs lines?—Yes; that was more interesting than anything. On 17th July it was reported to me that some dead rats had been found in the Customs lines. Huts were run up as quickly as possible for the inmates. Meanwhile, two men died suddenly, though displaying no symptoms of plague. Then another man was reported sick. He had no symptoms at first, but after being under observation for some days he developed the pneumonia form and died. When I first sent him up to the hospital they said it was not a case of plague at all. The reason we could not evacuate the lines at once was that the Customs employés lived in those lines, and it would have stopped the whole work of the Port. There was nowhere for them to go at all.

11,977. Were there any subsequent cases?—Not after they had gone into the huts, not after the first five days, I think. There were four cases after they went in, but none after the first five days.

11,978. Did it appear to you that there were any means, other than the rats, by which these people could get infected?—I do not think so, because they were people who practically lived down there, and did not go up to the rest of the town at all.

11,979. How near was the nearest case of plague?—About a quarter of a mile away, I think.

11,980. Did you find that the people in your division readily reported plague?—Yes, very well. We never had any trouble about that. There is only one man who must have had it for some time, and he was, unfortunately, a postman, and he spread it very badly.

11,981. You have been in charge of Kiamari camp?—Yes, since September 17th, 1897.

11,982. What sort of people did you detain in the camp?—Originally when we first went down, practically nobody coming from Bombay went.

11,983. Does this detention camp relate only to passengers by sea, and not those by road or railway?—Only passengers by sea.

11,984. At one time you only looked after in-coming passengers?—Yes.

11,985. Up to what date was that?—Till the end of April.

11,986. From August?—I went down there in September.

11,987. What was the number of in-coming passengers detained in your camp?—Altogether, 35,360. That was from the 1st August, 1897, to 31st December, 1898.

11,988. What was the number of out-going passengers?—7,310.

11,989. Had you some special arrangements with regard to emigrants to Mombassa?—Yes; all the emigrants proceeding to Mombassa were detained previous to departure.

11,990. There were special arrangements to permit of their going to Mombassa?—Yes.

11,991. What was the number of the emigrants for Mombassa?—7,103.

11,992. What was the maximum number you had in your detention camp at any one time?—When I first went there in December, 1897, there were about 2,400 people in the camp. There have never been so many since.

11,993. Did you detain every passenger coming in and going out?—People could obtain passes from the various Superintendents in the division.

11,994. If they had not passes you would not let them go?—No.

11,995. Now with regard to the people arriving at Karachi?—If they were respectable people whom we could rely upon, they were allowed to go originally.

11,996. People who would report themselves?—Yes.

11,997. You regarded people who would not report themselves as suspicious?—Yes.

11,998. How many cases of plague did you discover among the incoming passengers?—Seven.

11,999. Among what classes of people?—One Sindhi Sayad, from Bombay—that was on the 23rd March 1898, before there was any plague at all in Karachi. The Sayad had been nine days out of Bombay when he got plague. He was seven days in the camp before he developed plague at all. One Hindu Ahir, who came from Cutch; he was 36 hours only in the camp.

12,000. When did the man from Cutch come?—On May 11th. He had been 36 hours in the camp.

12,001. Who was the next?—Two Hindu Sadhus from Serangapatam.

12,002. When did they come?—In December.

12,003. They came *viâ* Bombay?—Yes.

12,004. How long were they out from Bombay?—About three or four days.

12,005. What was the next?—A Hindu Mahratta sepoy.

12,006. How long had he been out from Bombay?—He had been six days in the camp; he was attacked on the sixth day. He had only been two days in Bombay altogether. He was eight days out of Bombay.

12,007. Who was the next?—Two Konkhani Musalmans; they were taken off the ship.

12,008. How many of these seven cases were fatal?—Four.

12,009. How many out-going passengers did you stop with plague?—17.

12,010. Were they all residents of this place?—Yes, all Karachi residents.

12,011. How many of them died?—12.

12,012. How long did you keep those persons who were regarded as suspicious, but did not show any high temperature?—Originally the people coming from Bombay were kept eight days, and the people from Cutch 10 days. When plague got bad in Bombay, the people from Bombay were also kept 10 days—everybody was kept 10 days then.

12,013. Did you keep anybody more than 10 days?—Yes. Their temperature was always taken on the day of going out, and anybody who had a temperature of 100 or upwards was kept under observation.

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12,014. How many did you detain in this way?—143.

12,015. Did you do any disinfection in your camp?—Yes. The people were disinfected when they first came into the camp directly their names were registered, and on their being discharged. Originally we had no disinfection engines, and all the goods were put into phenyle and the persons themselves were bathed, but in April of this year we had a disinfection engine, and now their goods are put through the engine. They are disinfected when they come in and when they go out.

12,016. Do you disinfect anything else in addition to the actual personal effects of people who come into your camps?—Any clothing or gunny bags imported from infected parts.

12,017. Whether they are imported with passengers or not?—If they come with the passengers it is done as a matter of course, and if it comes with the cargo it is stopped in the Customs, and sent to the camp for disinfection.

12,018. (*The President.*) I see you summarise your experience in your printed précis of evidence. Will you read the passage?—Yes. To sum up from such experience as I have had, it seems that the chief enemies of the plague are fresh air, sweetness, and light; that in itself it is essentially a filth disease, and will, *ceteris paribus*, be much more likely to attack those who live in insanitary, unclean, and ill-ventilated abodes than those who have some acquaintance with, and pay some reverence to, the laws of hygiene.

(Witness withdrew.)

Mr. L. J. Mountford, I.C.S., called and examined.

Mr. L. J. Mountford, I.C.S.

12,019. (*The President.*) You acted as Assistant Collector in Rohri, I believe, during the outbreaks of plague there?—Yes. We had three outbreaks altogether at Rohri.

12,020. Where is Rohri?—About 200 miles north of Hyderabad, and 300 miles north of Karachi.

12,021. When did plague first appear?—The first local case was on the 26th February 1897, an imported case, which came across from Sukkur. Sukkur is separated from Rohri by the Indus; it lies contiguous on the other bank.

12,022. You satisfied yourself that that case came from Sukkur?—Yes.

12,023. Did other cases occur?—No other cases occurred till the 7th of March, when we caught a man coming across the bridge from Sukkur. A cordon had been immediately placed round Rohri, and all the approaches from Sukkur were watched. On the 7th March we detected a man coming across the bridge, and he died a few days afterwards.

12,024. What was the next case?—The next case occurred on the 10th March, also an imported case. The man's family had lived in Sukkur, and they had died of plague; he had relatives in Rohri, and came and lived with them, and died there. Then, until the 17th April, cases continued to occur. We had 22 imported cases from Sukkur, and on the 17th April 1897 we had our first local case.

12,025. You managed to discover each of the 22 imported cases?—Yes, we traced each case. Sukkur is only separated from Rohri by the river, and tracing them was an easy matter. None of them were Rohri men to begin with. People who had business in Sukkur very often came back to spend the night in Rohri. They use Rohri rather as a suburb, and transact their business in Sukkur.

12,026. What was your organisation for discovering these cases?—We had a system of detectives. Also, special powers were conferred upon me, and I ordered that notification of all cases of fever must be made. The contravention of that rule was punishable. Before the plague became local in Rohri, I convicted a man and gave him one month for not recording a case on the 6th April. The detective system also acted as a deterrent, and we generally got information very promptly. We also had all the burial grounds and burning ghats under police supervision, so that no corpse should be buried or burnt without it coming to our knowledge. They could not be burnt without it coming to our knowledge. They could not be burnt without being inspected by a Hospital Assistant, and a certificate given. But although there is no doubt that on account of the precautions we took, every case of plague was brought before us, yet they were often brought before us in a moribund condition. There was no chance of making away with the corpse, but the people did their best to stifle the matter until it was too late to save the man.

12,027. What measures did you adopt to prevent the spread of plague from these cases?—First of all, the houses were evacuated for 10 days, and we segregated all the inhabitants of the houses until the disease became local.

12,028. What did you do with the 22 reported cases?—I took them to the hospital, evacuated their houses, and the inhabitants of the houses themselves were taken off to the segregation camp. We did not disturb the neighbours at first.

12,029. Did you employ disinfection?—Yes, in the first cases, under orders then existing, we simply closed the doors and burnt sulphur, and then whitewashed the walls; but in a week those measures were considered of no use, and under further orders we first of all saturated the floor and walls with perchloride of mercury, 1 in 1,000. After that the coolies were allowed to go in with their boots on, and they dug up the earth of the floor and opened the roof, and if the house was very dark they also made holes in the wall. The floor was again saturated with perchloride of mercury after being dug up, and the walls were whitewashed, and everything found in the house was burnt. Then the house was closed for 10 days.

12,030. Was this successful in preventing any extension from these imported cases?—Yes.

12,031. In the first instance?—Yes. The case on the 17th April was our first local case.

12,032. What measures did you adopt then?—We began to segregate all the neighbours as well. By that time the camps were extended, as we saw that we were going to have a local epidemic at Rohri. I took out the inhabitants of houses by blocks. First of all we segregated three houses, one on each side of the infected house and the infected house itself. Then, on two occasions, I found a plague case two days afterwards only two houses away from where the original case had occurred. We then segregated six houses round, and eventually we segregated the whole block. The highest number ever taken away at one time was 140.

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12,033. How long did you keep those people out of the houses?—Ten days.

12,034. Were they allowed to return after 10 days?—Yes. The houses were disinfected when they left and when they came back.

12,035. And also sufficiently large openings were made?—Yes. The openings went straight through the various storeys up to the roof. In Rohri you often have four storeys to a house.

12,036. What was the population of Rohri?—Before plague reached Rohri it was 9,000 according to the census, and that was increased up to 10,000 by various merchants. As soon as the plague became local it was not more than 5,000.

12,037. You were dealing with 5,000 people then?—Yes, during the whole time of the plague.

12,038. Did you evacuate the whole town?—We never tried to evacuate the whole town at once. We evacuated whole blocks and quarters where one case occurred from time to time, and there the evacuation was wholesale and extensive. By not evacuating the whole town we were able to keep trade going under ordinary restrictions, while the evacuation of blocks prevented the plague from ever getting any real hold.

12,039. The evacuation was done piecemeal—in sections?—In as large sections as we could take. Towards the end, when I discovered that a special quarter was declaring more cases than another quarter, the whole quarter was taken out. In one instance 150 people were taken out and sent to the health camp while the quarter was gone thoroughly through.

12,040. In this piecemeal manner, how long did it take you from the start to the termination of the evacuation?—The cases were discovered in the early morning, and orders for evacuation in individual cases were generally carried out by four o'clock in the evening. The whole block was evacuated. The blocks were only evacuated where cases occurred, and at no time was the whole town empty.

12,041. In what month did evacuation commence, and in what month did it finish?—It took from the 17th April to the 30th June.

12,042. Therefore you cannot very well state how many cases of plague there were before evacuation was started, because it was going on the whole time. What do you think was the result of this evacuation?—The result of evacuation was that plague ceased there entirely by the 30th June.

12,043. How many cases had you altogether?—151, including the imported cases.

12,044. And what was the mortality?—92 deaths.

12,045. Do you think the result satisfactory?—I do not know that I am in a position to judge, but it is satisfactory in one way, that the town was never entirely empty, and yet we were able to stifle the plague in 2½ months without even dislocating business.

12,046. Was Rohri a place where the plague would be likely to have extended if you had not adopted these measures?—We had to stop plague from extending into the Punjab. Rohri is on the high road to the Punjab, and we had a cordon all round to keep the people in.

12,047. Were the local conditions in Rohri of such a kind as, in your opinion, would be likely to create a virulent epidemic?—Yes.

12,048. Were they especially favourable to it?—Yes.

12,049. In what respects?—Rohri is a particularly dirty town. The streets are very narrow. It is always ravaged by small-pox, and it has always shown a tendency to be unhealthy. It has a high mortality. According to our statistics the mortality is about 36 per 1,000, and, of course, they are understated.

12,050. You have a high opinion of evacuation as a plague measure?—A very high opinion.

12,051. Have you an equally high opinion of segregation?—Yes. Segregation and evacuation must go together.

12,052. What conditions do you consider essential to ensure success in segregation?—First of all, it is absolutely necessary that the inmates of the plague huts should be kept separate from the inmates of the neighbouring houses who are segregated, and before being allowed to enter a segregation camp everyone should be disinfected, and all the clothes boiled. Ordinary sanitary conditions must be maintained while in camp. The most important thing of all is to obtain early information, so that segregation can take place at once.

12,053. You attach great importance to isolating the sick?—Yes, the sick have their own special hospital.

12,054. And also to isolating the contacts?—Yes.

12,055. And to personal disinfection?—Yes.

12,056. These are, in your opinion, the three measures of chief importance?—Yes. The contents of houses are always burnt; everything in the house is burnt, except account books and books of trade.

12,057. (*Mr. Hewett.*) Did you have any mortality among rats in Rohri?—Very little indeed. I discovered six dead rats only.

12,058. It was not brought to your notice at all that there was any extensive mortality in rats?—No; we searched the godowns and did our best to assure ourselves that there was no mortality among the rats. Two of the six dead rats I discovered myself, personally.

12,059. When you had the people in segregation camp were they prohibited from going into the town?—Yes.

12,060. Can you tell us what was the maximum number you had in the segregation camp at any one time?—840.

12,061. What number of persons did you have to guard them, and keep them in the segregation camp?—About eight police.

12,062. Do you think that was enough to do the work efficiently?—Yes, quite sufficient, because the segregation camp was on a tongue of land separated from Rohri by the Indus and by the river Nara. There is only one way of getting to the segregation camp, and that is by the bridge or by the ferry. There is only one boat, which was under my charge. The bridge was guarded effectually by the Chief Constable, who is the highest official we have in the police, and therefore is fairly reliable, and there were four other constables on night duty, and four on day duty. The only cases we had escaping were two people who swam across. They swam across to find their friends, and when they were discovered they were punished. Unless the people swam across by night, which it was almost impossible to prevent, it would be impossible for anyone to come back to Rohri from the segregation camp. The bank was patrolled at night. I personally patrolled it myself.

12,063. On the Rohri side?—Yes. The part where they might swim across was patrolled. Whether they passed the police on the patrol by swimming I cannot say. It is not likely that any large number would like to swim across.

12,064. You had favourable conditions for segregating the people at Rohri?—Yes, extremely favourable for the segregation camp. One man who was caught going to the town was punished. I gave him two weeks imprisonment in order that that also might act as a deterrent. It was supposed that he swam the river.

12,065. You found him in the town?—Yes, the detectives found him. That was towards the end of the camp. The man was not from the plague segregation camp but from the railway detention camp. At the far end of this tongue of land, close by the bridge, we also had a train observation camp, and everyone who came to Rohri was sent there for ten days, because there was plague in Hyderabad, plague in Sukkur, and plague in Karachi. For fear anyone should escape and reach Rohri we had an observation of all arrivals at Rohri station. Everyone who came was taken to the station camp, and disinfected, and his clothes steamed by a tank engine, and he was kept there for ten days.

12,066. Were all the people who came by train from Karachi and intermediate stations treated as suspicious, and detained?—Yes; their temperatures were taken once a day in the plague segregation camp. In the camp where the neighbours of plague cases were, their pulses were merely felt; their temperatures were not taken because they were too numerous.

12,067. Were they deterred from travelling by the knowledge that they would be stopped by you?—Yes.

12,068. Did you put the people who came from Karachi and intermediate places on the island on which you had your plague contacts?—Yes, but the camps were separate.

12,069. How did you keep the contacts from communicating with the detained passengers?—At the far end we had the camp of the inmates of the houses; they were roped off with stakes and so on. There was an interval of 200 yards, and then came the camp where we had the neighbours segregated. Then there was another interval of about 50 yards, where we had the arrivals by train under supervision. They were very few, never more than 20 at a time. They were afraid of mixing with these men, and as a rule they were people of completely different castes, and had no desire to mix with each other. It would, of course, have been advisable to have all three camps in different places, but Rohri is situated on limestone hills and rocks, and we could not have got any water.

12,070. Had you any other force on the island to prevent the inmates of the three camps from communicating with one another?—The police were on duty under the Head Constable. Their duty was to patrol the camps, and keep law and order there, and see that the people did not mix.

12,071. Did any cases of plague occur in the segregation camps?—Yes.

12,072. Were there any cases among the passengers who were detained?—One.

12,073. Did you find out how he got it?—No; he was said to have caught it in the train, but it was not proved at all, and it is quite possible he caught it in the camp, because we had plague in the camp.

12,074. When people went back to their disinfected houses after ten days, what measures did you take to prevent them communicating with the parts of the town which were still evacuated?—It was impossible for any one to enter a block until permission had been given. There was a law against that, and there was also their own fear of entering the block. The blocks were closed, the houses locked and specially marked with a red cross and circle, and were patrolled and under observation of police on special duty. A list of houses which were to be occupied on a certain day was given to the Inspector, and he saw everything was right in the houses, and admitted the people personally. The house had been locked up after it had been thoroughly disinfected.

12,075. You had the keys of all the houses?—Yes, we locked them up personally with ordinary Sindi locks. Of course, there was constant patrolling. I was assisted by various Staff Corps Officers, and others who had charge of the camp.

12,076. When the people got back to their houses did they still keep the ventilation openings which you had made?—No; they did their level best to close them with gunny bags, and all the rubbish they could lay their hands on.

12,077. Was the temperature increasing as the epidemic declined in Rohri?—Yes.

12,078. Did any outbreak take place beyond Rohri?—Yes, in the Rohri suburbs we had an outbreak four days previously, and the mortality was much higher than the Rohri mortality. This was about 2½ miles away from Rohri.

12,079. What did you do there?—We treated the people in the same way. We had our hospital there, a hospital formed of sheds. Of course we had a segregation camp, but the people had left their villages—there were five villages—and had run away into the date plantations and segregated themselves voluntarily.

12,080. Did they have much mortality when they were in these plantations?—Yes, the mortality continued. Indeed, it was only shortly after they ran away that we had any idea the mortality was so severe. They ran away because dead rats were discovered all over their houses.

12,081. Were they disinfected before they went into this camp?—No; it was done really before we got news of the plague. We had our eyes centred on Rohri at that time, and we were patrolling the various towns round Rohri. Some refugees came from Sukkur across the river by night, and took refuge in these villages, and several cases of plague were reported. Six cases were reported to me as imported, and I went down to take measures and found that panic had seized them all, and that they had run out into the date plantations. They segregated themselves in blocks, from 20 to 50 in each block, and the mortality continued among them. Even when we took to breaking up blocks, and segregating the people personally, it did not have much effect.

12,082. Do you attribute their suffering so severely partly to the fact of their not having been disinfected?—Certainly, to the fact of their running away and taking all the plague cases with them without attempting to separate the plague cases or to observe ordinary sanitary precautions of keeping away from plague infected clothes. The clothes of the dead even were carried away by them.

12,083. Have you had any outbreaks in villages north of Rohri besides this?—Yes, we had outbreaks in two villages. The main outbreak was in Dahirki; that is one station on this side of Reti, which is the station nearest the Sind frontier, and that was getting close on to the Punjab. There we had 34 cases and 23 deaths.

12,084. Did you evacuate the villages?—Yes.

12,085. What is the population?—1,586.

12,086. How many persons did you get into camp?—The numbers were not taken. We got about 1,000. They had evacuated themselves. About 200 remained in the town whom we turned out. Plague was reported to us, and I went up with Major Baker, I.M.S., and we found that nearly all had evacuated the town—all except 200—and they were scattered in huts all round the town. They had segregated their own sick in separate huts, and evidently possessed more common sense than the other Sindi, because they did *not* mix with their own plague cases, and they were more amenable to treatment for that reason.

12,087. How long did it take you to suppress that outbreak?—It opened on the 10th April, we got news of the outbreak on the 10th. I got news of about five cases occurring there suddenly on the 17th April. I went up there on the 18th, and we evacuated the entire town. The cases went on until the 12th May, and then we had the last case of all on the 24th May. We let the people back into the town on the 5th June, and had no more cases.

12,088. Had that begun before it began at Rohri?—Yes, before it began locally. It was brought by people from Karachi, some Marwaris.

12,089. Did you have any mortality among the people engaged in disinfecting in Rohri?—None at all.

12,090. How many people had you engaged on the work of disinfection?—At the height of the plague we had at least 60 coolies.

12,091. Did you notice whether plague attacked any particular classes?—No. Of course the mortality was far higher among the Hindus than the Muhammadans. There were seven cases among the Muhammadans and 111 among the Hindus.

12,092. What is your Muhammadan and Hindu population respectively?—They are about equal, but I ought to say that more Muhammadans had run away.

12,093. Can you give us any idea of what the actual proportion of Muhammadans and Hindus was during the outbreak?—About five Hindus to one Muhammadan.

12,094. Did you observe anything as regards the mortality from ordinary causes during the outbreak of plague?—Yes. During the 2½ months we had plague the ordinary mortality was only five persons. If the town had been full the ordinary mortality should have been 57, but taking the proportion of people who had run away among those remaining it should have been 31¾.

12,095. When you evacuated a particular block did you notice that the plague spread to the nearest houses in the next block?—It was quite impossible to trace it.

12,096. Did you find that it went to a distant portion of the town, or only to places that were close by?—It often went to a distant portion. I could not make any deductions at all from the direction it was taking. I thought once it went in a straight line when we had three cases in rapid succession in a straight line, but after that we had some cases at the north end, and then at the south end; it rang the changes on all the quarters of the town.

12,097. (*Dr. Ruffer.*) Could you tell us the number of pasesngers by train that you examined?—No, but I can tell you the number we took into our camps. We began the examination on the 12th January, as soon as plague was discovered in Karachi.

12,098. Can you tell us the number of people sent to your camp?—266.

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12,099. One of them got plague?—Yes.

12,100. You are not sure that he did not get it in the camp?—It is quite possible he did.

12,101. (*Mr. Cumine.*) With regard to the three adjacent mufassil villages you said that the inhabitants segregated themselves; do you mean that they segregated themselves or that they evacuated themselves?—They did not segregate themselves, they rather evacuated the houses.

12,102. Do you know whether they abstained entirely from visiting the infected village site?—Completely, when they were under my care. The disinfection was taken in hand at once. One or two men who remained were immediately turned out of their villages. The people themselves had the greatest fear of going into their villages. They would not return even after the disinfection of the village for a long time.

12,103. They continued to die off in large numbers?—Yes, when they were in these plantations.

12,104. Could that have been due to their visiting the infected village site and going back to their houses?—It was quite impossible. They had cases among them at the time, and it was a terribly hard matter to discover the plague cases which were among them, because they were in and out of those gardens. We would frequently find people with a corpse among them.

12,105. How could you be sure they did not visit the infected houses?—Because they were some distance away from the houses, and the houses were under police supervision.

12,106. After you were sure they did not visit their villages, how long did the infection continue among them?—About a month.

12,107. (*The President.*) What, in your judgment, were the proper measures neglected in the case of this group of persons which you have just been asked about?—First of all it was necessary to secure the immediate report of plague cases, which was not done. If that had been done we could have taken them in hand; we could have found out who were the sick among them and evacuated the town at once and segregated the sick and disinfected all the inhabitants and taken them off to a separate camp. We were unable to do that until we eventually hunted them in these various gardens where they were hiding with their sick.

12,108. They were living in the open and apart, you say?—Yes.

12,109. In these date plantations?—Yes.

12,110. But although they were living in those otherwise good conditions, the plague extended and continued to extend among them?—It did.

12,111. What is the reason of that? What is the condition that was lacking there?—They had sick among them at the time and were in daily contact with the sick; they were also in actual contact with the corpses at the time.

12,112. That is the main fact?—That is what I consider to be the main fact.

12,113. (*Mr. Cumine.*) Did that go on during the month that you took them in hand?—The cases continued a month after we had taken them in hand.

12,114. Why did it continue then?—I am afraid I cannot say.

12,115. Did you surround the evacuated village site with any policemen to prevent the people going back into their houses?—No.

12,116. Then how are you sure they did not continue, during that month after you had taken them in hand, to go into the infected village site?—Because we were daily in the village.

12,117. But nightly?—No, not at night. There were police patrolling the villages at night. The disinfecting gangs were also on duty there at night. The reason why we did not put a cordon round was that they had all run away, and seeing they were frightened of their villages we thought that fright alone would prevent them going back. At the same time we took every precaution short of putting a cordon round. We had already drawn upon our Municipal resources to a considerable extent. I should like to add with regard to what I said about the plague continuing for a month after we took the management of the gardens in hand, that that was not done in a day. It took us over a fortnight before we could really bring all our operations to bear upon the people, because they were hiding away in the thick undergrowth, and we had to scour through the undergrowth with mounted men. At that time also we had plague work in Rohri which claimed much of our attention, and so for a fortnight very little was done in the plantations. On the 25th April I had a special cavalry officer sent to me who was put on this work completely, and then we got the people more or less under control. As they were scattered about in small batches among the gardens, we could never insure that we had all the infected people in the camp. When we found a corpse or a dying man in one batch we could not assure ourselves that some of the members of that batch had not scattered themselves among other batches. We merely took away the sick and segregated the men we found in that immediate vicinity. Whether or not the men who had been attending him had spread the disease in other batches we could not tell. We never attempted to take these men and separate and disinfect each and every person, because they had already spread themselves into these various batches. The arrangements there were of secondary importance to the large outbreak in Rohri.

12,118. Was a point ever reached in which you made it impossible for the people to communicate by night with the evacuated village site?—It was never impossible, but utterly improbable. The villages were in charge of police, and any return would at once have been reported. Occupation of a plague house before permission is given is punishable by law. People, owing to their fear, would not return to their villages for a long time even after permission was granted. An utterly empty village, a police guard, dismantled houses, unfloored and undergoing vigorous disinfection, do not invite a return, with imprisonment to follow, especially where villages had been voluntarily quitted.

12,119. (*The President.*) During this month they were practically under proper conditions only for a fortnight?—In that month, yes.

(Witness withdrew.)

Mr. R. Giles.

Mr. R. GILES re-called.

12,120. (*The President.*) I believe you wish to make a statement with regard to the plague at Rohri?—Yes. I noticed in a report by Mr. Mountford, and I think he said the same thing in his evidence, that the removal of the people to the date groves at Rohri was not so successful, as there were a great number of cases afterwards. That was due, no doubt, in part to their having the sick with them, as they had done in some of our camps, but the principal cause of the disease remaining was, I think, very likely the ground upon which they camped. I happen to know the ground extremely well, and it is what I should call extremely insanitary. The date trees are very thick indeed, so that you can hardly see the sun at all. It is close to the town of Rohri itself, with roads running all about it. According to the native custom the people go in every morning for necessary purposes, and the whole place is about as insanitary as it can be. It struck me at once, that if we had had a bit of ground like that in one of our camps, I should have expected bad results to follow. I think that may explain their having more cases in that particular camp.

12,121. In your opinion the light and ventilation are very defective?—Yes.

12,122. And there is much uncleanliness?—Yes; it is a very insanitary spot. I have had peculiar reasons for knowing it intimately.

12,123. Can you tell us why disinfection has been stopped here?—I was not aware myself that where we got a case actually in the house, that that particular house was not disinfected together with the kit. When I spoke yesterday against disinfection, what I meant was, that I do not think that the general disinfection of the houses in the city justifies the expenditure, but I think it would be better to continue the disinfection of the houses where there has actually been a case of plague. The method always had been.

that directly the sick and the contacts were removed the house was disinfected.

12,124. (*Mr. Hewett.*) Dr. Seymour promised to give us a statement of the camps under his charge, to show, first, the number in each camp, and secondly, the number of cases of plague which occurred in the first ten days after the people had got there. I wish to know if you could give us some information as regards the camps which were under Muhammad Yakub?—I think you could have the population.

12,125. Could he not provide the rest of the information?—I do not think he could.

12,126. Could he tell us, for instance, how many cases there were in the first ten days?—He could not do that, because his supervision was very different. It is very necessary to understand that he was Superintendent of the Trans-Lyari regular Quarter of the city, and the ordinary procedure was supposed to be carried on there, but the voluntary camps were in an area beyond, and in them there was very little sickness compared with what there was in Dr. Seymour's camps. In Dr. Seymour's camps the people went out, as I said, entirely of their own accord. Really we knew very little about the origin of these camps. The people were dirty, Cutchis and Tanais, and they built their huts much too close together. All the huts were close to each other and they got the plague amongst them. That is why we sent Dr. Seymour there because they wanted very much more attention than the camps under Muhammad Yakub. His camps were generally in very good order indeed. They were much more isolated. There was no crowding and very little sickness.

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12,127. There appear to have been three grades of camps; first of all the voluntary camps in which the people were practically left to themselves, secondly, the voluntary camps, in which there was a certain amount of supervision by Dr. Seymour?—They may be considered the same.

12,128. Have you not been drawing a distinction between them?—We did not put a medical man on the spot to attend in the voluntary camps under Muhammad Yakub. We only had a Medical Officer, Dr. Lewis, going round; he would ride round once every two or three days, and that was all.

12,129. You had less supervision there?—Much less supervision.

12,130. Than you had in the voluntary camps supervised by Dr. Seymour?—Yes.

12,131. And the segregation camps as well?—Yes, in the regular area of the Trans-Lyari Quarter.

12,122. Can you tell us what classes of people were compelled to go to the segregation camps instead of being permitted to go into voluntary camps?—When actual cases of plague occurred in the town itself, as long as I was on the Plague Committee, we continued to take the people in the house to the segregation camps, and when I left the Plague Committee the segregation camps were still carried on as before.

12,133. That is to say, that if there was an ascertained case of plague, the sick were taken to the hospital and the contacts taken to the segregation camp?—Yes.

12,134. And that policy continued to the end?—Yes, until the end of my time on the Plague Committee.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Frere Hall, Karachi.

THIRTY-FOURTH DAY.

Wednesday, 25th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Mr. A. CUMINE.
Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Captain G. W. JENNEY, I.M.S., called and examined.

Capt. G. W. Jenney, I.M.S.

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12,135. (*The President.*) You are in the Indian Medical Service, and doing work as Special Port Officer?—Yes.

12,136. What are your medical qualifications?—I am a Bachelor of Medicine of the Royal University of Ireland.

12,137. (*Dr. Ruffer.*) Since what time have you been in charge of the Port?—Since May 1897.

12,138. You have been in charge during the whole of the late epidemic?—Of the 1898 epidemic.

12,139. Could you tell us the measures taken with regard to passengers coming from infected ports?—When a ship arrives from infected ports she comes in under the quarantine flag. Nobody is allowed to board her except the customs, police, and pilots, of course, and no one is allowed to leave until my examinations have been carried out, except the mails. When I go on board I muster the passengers, and I see that the numbers of passengers I find I have mustered correspond with the numbers that ought to be on board, as shown by the ship's people and by the bills of health. As soon as I am satisfied of that, I carry out a rapid examination in order to find out if anybody is ill on board. If I am satisfied of that, I then separate the passengers into groups — those who are evidently respectable people or who can give evidence that they have a fixed address at which they can easily be found, and who, there is no doubt, would report a case of illness if it did happen. They are set aside, and the rest of the passengers are removed to the detention camp at Kiamari. Then the crew are carefully examined and ordered to remain on board during the stay of the ship in Karachi, and the captain is warned that he is responsible that they should do so.

12,140. Do you put the crew into quarantine?—No, they have to remain on board.

12,141. I suppose you go through a rapid examination of the crew?—Yes.

12,142. In the rapid examination of the passengers, what points do you chiefly attend to?—The general appearance of a man—his facial expression. If any man appears to be in the least ill, he is examined with a thermometer, and a further examination is carried out if the thermometer shows any rise in temperature.

12,143. Do you examine the axillas and groins systematically?—Not in every case.

12,144. Only if you suspect anything?—Only if I have a suspicion that the man is ill.

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12,145. What is the number of passengers examined during your term of office?—I am afraid I have not got the passengers separate from the crew, but the crew and passengers together number 69,366 from August 1st, 1897, to December 1st, 1898.

12,146. How many cases of plague did you discover in that time?—Among these I only discovered one case of plague, and that was reported to me by the ship's doctor as a probable case.

12,147. Was that a bubonic case? — Yes, it was a bubonic case.

12,148. A mild case?—A mild case, yes.

12,149. Did the man die or recover?—He recovered.

12,150. For how long do you detain passengers in the detention camp?—There have been various rules of different kinds on that point.

12,151. Please explain the rules you have applied since you have been Port Officer? — When we first came, anybody who was not a clean person was sent to the camp for disinfection, and if we could get perfect guarantees for him where he was going, that he would be kept under observation, he used to be allowed to go. That was the first thing, but when the plague finished in Karachi in 1897, then a rule was brought in that everybody was to be detained for 10 days. On the breaking out of the epidemic in 1898, and the appointment of Superintendents in Karachi, so that more supervision should be exercised in the city itself, that regulation was done away with more or less generally. I began to allow people to go away on the guarantee of representatives of their own caste—for instance, Parsees, Khojas, and particularly Cutchi Lohanas—who came up. I got into touch with their better people, and they used to take away respectable people of their own caste and make themselves responsible that they would report at once any case of illness.

12,152. Did you disinfect the people before they were allowed to enter the detention camp?—On going into the detention camp they were disinfected.

12,153. How was the disinfection carried out?—At first in a tub of phenyle, and lately we have started the steam disinfector.

12,154. Since when?—I forget the date exactly when we got that. In the beginning of last year we had it.

12,155. What are the things to which you paid most attention?—The whole of the passengers' personal kit—clothing and bedding particularly. I was always extremely particular about resais and bedding and clothing. Clean silk garments that would be ruined by disinfection we did not attend to so much—clean silk garments mostly belonged to women. They only wear them on occasions, and they are not so dirty and foul as the rest of the kit.

12,156. What kind of steam disinfector have you got now?—It is an Equifex steam disinfector. It consists of a cylindrical receiver made of boiler plate, with an ordinary Lancashire vertical boiler attached to it. There are two doors at each end, and there are a couple of little rails and a cradle to take kit in.

12,157. An ordinary steam disinfector with a wooden jacket round?—Yes, the usual thing. It has a little arrangement by which, after the clothing is put in, you get a negative pressure inside of about 12 to 15 lbs., and then the steam is admitted at a pressure of 50 lbs.

12,158. What temperature do you get in the disinfector?—125 degrees Centigrade.

12,159. Do you find that the clothing and the personal effects are spoiled by steam disinfection?—I have seen many of them come out, but I have never seen the least damage done.

12,160. How do you disinfect leather goods?—We send them through; it does not spoil them. We have not a great many leather goods, but it does not affect them; they are only in for a very short time.

12,161. What is the number of passengers who have been detained in the camp?—35,360.

12,162. How many of them got plague?—Of the passengers, five; and one man belonging to a crew who was sent ashore as a suspicious case.

12,163. Of these five passengers, how many were pneumonia cases?—None.

12,164. How many died?—Four.

12,165. When did they show the first symptoms of plague?—That varied; they were mostly very late cases. Bakn Shah arrived from Bombay on March the 17th by the steamship *Dwarka*, which left Bombay on the 15th of March. He was believed to have fever on the evening of March the 22nd. He developed bubo on the morning of the 23rd of March.

12,166. When was that man disinfected?—On arrival. He arrived from Bombay on the 17th.

12,167. So that he got the plague about 4½ or 5 days after the last disinfection?—Five days. He said he was ill the night before. He was not discovered for six days after coming into camp.

12,168. He was probably ill on the 22nd?—Yes; he may have been ill a day or two before.

12,169. Could you tell me exactly how that first case was disinfected?—He was disinfected by phenyle.

12,170. Perhaps you will read all your notes of these first cases?—He was discovered to have a small inguinal bubo, on the morning of the 23rd, on the left side, above Poupart's ligament; the temperature was 102, the pulse 110, very feeble and very soft. The temperature rose to 104 and he was delirious on the 27th. His pulse, however, was improving at that time, and his temperature became normal on April the 1st. The gland suppurated on the 3rd April; and he was discharged, cured, on the 18th—an ordinary typical case. His previous history was given willingly, for he and his companions were intelligent men, and appeared grateful for what was done for them. It was as follows. He was a Sayad. He ranked as a Pir, and a very holy man; and had, it seems, a special connexion with Memons. He had been on a sort of visitation down the Malabar coast; and on his return spent eight days in Bombay in the Memon Muhalla. He did not know, or would not tell, in whose house. He was returning to Sehwan, where he resides. Sehwan is in Sind, with a population about 4,500, and a well-known place of pilgrimage.

12,171. Please give us an account of the second case?—The second case was a man from Anjar, in Cutch—that is where he said he was from. He was a coolie, with hardly any kit at all; and he came as a stoker by the s.s. *Bahaduri*. On arrival he was taken to the detention camp, where he was found to have plague on the evening of the 12th. He became rapidly unconscious, and died in the early morning of the 13th. We could get no history from him as to his movements, and the people who had come up with him denied any knowledge whatever of him.

12,172. The incubation period in that case could not have been more than two or three days?—No, it must have been very short.

12,173. Please proceed to the third case?—The third case was that of Private Ratnap Kadam, 1st Bombay Grenadiers, who had been on six months' leave to Malgaon, Ratnagiri district. He arrived on the 16th of May 1898, and was found to have fever on May the 21st. He had probably been ill the day before—the 20th.

12,174. That would be an incubation period of four days from the time he had been disinfected?—That ship left Bombay on the 13th.

12,175. He was disinfected on the 16th?—He was disinfected on the 16th, yes. Bubo was discovered on the 21st, on the right femoral region. He became delirious the same morning and died early the next day.

12,176. That is two deaths? — That is two deaths. There were four deaths and three recoveries amongst the imported cases. He had stayed a day or two in the Marine Lines, Bombay. Ratnagiri was not infected by plague. The next two cases came together. They were passengers. Two Sadhus arrived by the s.s. *Satranji* in December 1898. As they gave an address in the town, they were to be discharged, but they were found to have a rise in temperature, and, in consequence, kept under observation. There were no symptoms of plague on them then. The next day they were found to have plague symptoms, and were sent into the Civil Hospital.

12,177. The incubation period in these cases was well within four days?—About four days—it could have been four days, but it might have been more. These people's movement were uncertain. They were wandering religious men. They had been to Nasik, and from there they went to Seringapatam, and from Seringapatam they came to Karachi *viâ* Bombay; but

where they were staying, and how long they had been in Bombay we do not know, and where they were going to we did not know. They said they were only a few hours in Bombay.

12,178. Will you give us the other cases?—The other two cases were cases of the crew. A stoker of the s.s. *Patna* was sent ashore by the other Health Officer of the Port on the departure of the ship; that was on the 27th March. I saw him that evening, and I discovered a small sub-maxillary bubo. His temperature on being sent to the shore was 101. In the evening it was 104·2. He had a small painful bubo under the jaw. He was at once sent to hospital.

12,179. How long had the steamship been in harbour?—The steamship had been two days in the harbour.

12,180. She came from Bombay?—Yes; she left Bombay on Thursday evening and got in here on Saturday, and the patient was removed on Monday morning.

12,181. That is four days again?—Yes.

12,182. What was the other case?—The other case was a stoker on the s.s. *Bahaduri*. She had been coasting and came up along the Kathiawar and Cutch ports. He was reported to me as suffering from plague.

12,183. Was there plague in those ports at the time?—There was plague in those ports at the time. The last port Cutch Mandvi is about 17 hours from Karachi. He was an oldish man, and the doctor of the ship reported to me that he had very suspicious symptoms. I examined him and found he had a rise of temperature and a femoral bubo. He was removed at once to hospital, and the case looked doubtful; but after that he became delirious and very ill, and showed the usual symptoms of plague—the bubo suppurated, but, however, he recovered.

12,184. In all these cases the incubation period was well within five days?—If they were infected from their own clothes coming up.

12,185. Except the first?—The first man would have been six days.

12,186. But he might have been infected from his clothes?—He may have been infected from his clothes possibly coming up, or it may have been a long incubation period. From the very careful precautions in Bombay, I should think it is probable that an exceptional case of long incubation period would be more likely to escape their notice.

12,187. Are the clothing of the crews and passengers disinfected before the ship leaves Bombay?—No, I think not.

12,188. You detain all the passengers with high temperatures?—No man was allowed to leave the detention camp without having a normal temperature.

12,189. Those are all the cases that you got?—Those are all the cases—seven cases.

12,190. Do you disinfect the ship?—In the case of plague being discovered on board?

12,191. When no case of plague has occurred?—No.

12,192. What do you do with the Customs House people, the Police, and the Pilots on board the ship, are they disinfected?—No, they go freely.

12,193. They have to report themselves, I suppose, for some time afterwards?—Oh no, they are all Government servants, and well known to me.

12,194. Could you tell us whether the system has been modified lately?—We tried, as I say, quarantine by detaining everybody who came through, for a year. It was so very severe on the people, and we had to do all kinds of things to try and make it easier for them, and considering the very small number of plague cases that came up, practically only five cases among passengers, it appeared to be a rather unnecessary hardship.

12,195. You think it is an unnecessary measure?—I do not think it is a good measure.

12,196. What do you recommend instead?—I think the measures that are carried out now ought to be extremely effective.

12,197. Can you tell us what they are?—The thing that underlies them all is to try to get early notification of a case if it happens to be brought up, and to do that, as I say, we separated people into groups, and those of apparent respectability and who are clean in their kit are allowed to go at once. I simply take their addresses, and in very many cases I do not even order them to report themselves for supervision. If I think that would be required I order them to report themselves for supervision and send their names to the Plague Superintendent.

12,198. As a matter of fact you detain very few people now?—There is another batch—people who have settled houses but whose clothing is dirty and who appear as though they would be likely to carry infection. They are sent to the detention camp at Kiamari where their clothing and effects are disinfected. The Plague Superintendent has either already sent down their address that he has verified or he is communicated with to do so, and as soon as their address is verified they are allowed to go, but they are ordered to report themselves at certain dispensaries which have been picked out as convenient places. Then there are a few people who have no settled residences, and we can find out nothing about where they are going, and where it would be very doubtful, if they did get ill, whether a case would be reported; those people are detained for eight days.

12,199. What is the risk of passengers bringing plague into a country by sea?—I think by sea the risk is much less than it is by rail—very much less, *i.e.*, of plague being introduced by an actual case being introduced into a place. The danger from infected clothes and bedding is great, but easily guarded against by disinfection.

12,200. Why do you think so?—A journey by sea is generally a bigger undertaking than a journey by land, and I think a man who is feeling at all unwell would not be so likely to travel by sea. If he had had sickness in his family I do not think he would be so likely to undertake the moving of all his kit and all his people by sea. These people mostly move every stick that they possess, and the journey is, as a rule, longer, and the man is more or less under observation; he is living publicly on the deck of a ship, and if a case occurred it would be very unlikely to escape notice.

12,201. Do you disinfect all the cargo?—That is quite out of the question. We could not possibly do it.

12,202. Quite so, but I suppose you disinfect certain things?—Certain things are prohibited from being brought altogether.

12,203. Could you give us a list of the prohibited things?—Rags, hides, bones, and hair—by the Venice Convention.

12,204. Can you tell us why rags, hides, bones, and hair are prohibited?—No, I only have to work upon what is given me.

12,205. Do you think there is any sense in that prohibition; do you think these things are at all likely to carry plague?—Personally, I do not. I have not carried out any experiments, and I cannot tell.

12,206. Have you ever heard of an animal except a monkey or a squirrel or a rat getting plague?—No, I have not.

12,207. You have not heard of a larger animal?—I have heard of suspected cases of cats and dogs, but I have never seen it.

12,208. You think there is no sense in the prohibition of the Convention of Venice as to hides, bones, and hair?—Well, there is this exception that hides are stored in very dirty places.

12,209. So is most cargo?—A great deal of it is, but not all. It would be very easy for hides to get infected. Whether infection would remain in a hide that had been carried up in the hold of a ship I do not know.

12,210. Is the contagion more likely to remain alive in hides than in anything else?—I could not say that, unless experiments were made.

12,211. There is nothing to show that they might carry disease at the present time?—Not in my experience, but it could hardly come in my way.

12,212. What are the things which you disinfect?—At the present moment we disinfect nothing except old gunny bags; large quantities of used gunny bags which are brought back.

12,213. How are they disinfected?—By steam.

12,214. Do you think there is much risk of infection by cargo?—I think there must be.

12,215. In what way?—When the 1898 epidemic broke out we admitted in the end of March the first case that came by sea. The first case that occurred which was reported in the town at the end of March was that of

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a carpenter in the employ of the Harbour Works, he was employed in the Mansfield Import Yard where the stuff from Bombay was taken to.

12,216. Was he a ship's carpenter?—No, a Harbour Works carpenter. Very shortly afterwards a boy called Hyat Khan who lived with his brother, a Harbour Works Policeman, in the Police Lines at Kiamari was attacked by plague, and he was admitted on the 31st of March. He was employed on the Native Jetty where the cargo from Bombay is landed; it is brought up in boats from the ship and landed at this jetty. This young fellow was a Panjabi who lived with his brother. They had no family or relations in Karachi, and his officer, the Inspector of the Karachi Harbour Police, told me that those fellows lived altogether by themselves; they did not associate with anybody. There was a little plague up in the Punjab at the time, but they did not come from a district where the plague was. They had had nothing sent down from the Punjab, no kit or clothes or anything, and I could make out no other way of his being infected, unless he had been infected by the cargo landed at the Native Jetty.

12,217. Did you disinfect the clothes of the crew?—No.

12,218. Might not the infected people have bought clothes from the crews?—I do not think they would. They were Punjabis. Another thing, they would not have been able to get near them. The crews were not allowed to land; the Captain was responsible for them.

12,219. Do you think that rule was always observed; did the number of the crew ever evade it?—Every man we found ashore we took into custody. Three or four that were once caught we ran in; but I do not think it was likely that the rule was often broken.

12,220. Do you consider there is any proof that these people were infected by cargo, or do you think it is simply a possibility that they may have been?—I think it a most likely way. It was very curious that these two people were living in a house by themselves in a quarter which had not been infected in a previous epidemic, and there was no case of infection remaining in the house.

12,221. Will you tell us the measures applied to outgoing passengers?—Of course, measures for outgoing passengers differ widely when there is an epidemic in the city, and when there is not.

12,222. I mean during this epidemic?—During the time of epidemic the Plague Committee ordered that all passengers leaving Karachi should either obtain a special pass from the Plague Superintendent of their district, which was only to be given to people who were living absolutely wide of any possibility of infection, or to people going on special business which would take them a short time away. There was an order that special passes were never to be given to people with large families travelling with them. The rest of the people were detained for 10 days before they could go away, and, of course, disinfection goes with detention.

12,223. Did you find that a practical rule?—It worked very easily.

12,224. You found that the people submitted to detention for 10 days?—Very easily.

12,225. You are sure there was no fraud, that people did not get on board without being detected?—I do not see how they could manage it. All the people are sent to the steamers. The way this worked is this. The very large majority of these people—over 99 per cent. of them go by local steamers trading between Karachi and Bombay. These steamers take their passengers out in the streams, they do not come alongside the wharves, and the way we worked it was that all the people from the camp were sent to the steamers under police escort with passes given to them in the camp. They were sent on board in a batch and kept together. Then the police with Assistant-Surgeon Mackenzie, the Port Health Officer, who took the outgoing passengers, examined every man personally, and at the same time saw his pass—he must have a pass of some sort. Special business passes were given to known men whom the Superintendents knew. The Superintendents gave passes to men of good class and they were not likely to exchange them, and our men could not, because they were under police escort from the time they left the camp till they were on board the ship.

12,226. These rules are not enforced at present?—No.

12,227. During that time, when that system was in force, did you get any cases of plague on ships which had sailed from Karachi?—No, none were ever reported to me.

12,228. Is there any system in force at present?—At present nothing but medical examination. Every boat that leaves the Harbour Assistant-Surgeon Mackenzie examines.

12,229. No disinfection?—No.

12,230. There is no detention either?—There is no detention either.

12,231. Are there any other special rules?—During the epidemic in Karachi, and, in fact, even now a rule is in force that no emigrants were allowed to depart from Karachi at all, and the rest of the emigrants were to be detained for 10 days.

12,232. When you say no emigrants, you mean no large number of emigrants?—No emigrants travelling under a contract. Emigrants going under a contract have to comply with the Emigration Act, and they are technically emigrants. Artisans and men of superior class are allowed to go, but the ordinary emigrant coolie practically never goes on his own account. He would not know how to get there. He is always recruited, and they were not allowed to recruit in Karachi.

12,233. Is that rule in force now?—Yes, that rule is in force now. During the time of the epidemic in 1898 there was a rule as regards these emigrants—practically there is only one lot, and that is the emigrants going to Uganda—that they were to be detained for 10 days in some camp. Most of the time they had been detained in Kiamari. One time they were detained up-country at Reti. There their clothes were disinfected. There was a little plague still about the Punjab, and they might have picked it up, or bought clothing at different infected places, so their clothes were thoroughly disinfected before they went—when they arrived in camp and when they went out again. Their temperatures were all taken before leaving camp, and they were then sent by a police escort straight on board ship.

12,234. How many passengers and crews have you examined on outgoing vessels?—Assistant-Surgeon Mackenzie has always taken the number of outgoing passengers, and he can give you that information.

12,235. Assistant-Surgeon Mackenzie will give us the cases detected, and the numbers detained?—Yes; but as a matter of fact I do not think that there were any.

12,236. I thought there were 17?—Those never came under him. They were detected in the Kiamari detention camp. I find there were 17 cases; four were sent to the Civil Hospital. Two died, and two were uncertain. One was found in a dying state in a camp. 12 were treated in Manora Hospital. Seven died, and five recovered.

12,237. How many people were detained?—People leaving by sea, 7,310.

12,238. Between what periods?—Practically that is in April, May, and June.

12,239. How many cases of plague did you get?—There were 17.

12,240. Could you give me any details as to what kind of plague they had, was it bubonic plague?—Nearly all bubonic.

12,241. Could you tell me the mortality?—No, I am afraid I could not do that. They were sent to various hospitals, and I only had a small hospital across at Manora, which was very overcrowded, and they had to be sent to other hospitals.

12,242. You cannot give us any details?—No. I expect Mr. Law could.

12,243. You have noted in your précis of evidence that you are prepared to speak of the "treatment of actually infected ships." Were the three ships you refer to the *Patna*, the *Bahaduri*, and the *Bhandara*, ships going from or coming to Karachi?—The *Patna* was leaving Karachi, but unfortunately a case was landed as a suspicious case. She went away in the morning, immediately after the arrival of the English mails. She was examined in the morning, and Assistant-Surgeon Mackenzie noticed this man was ill, but he could not find any bubo. He found, however, that he had a rise of temperature and looked ill, and he landed him as a suspicious case. The case was diagnosed that evening by me as plague, and a telegram was at once sent to the nearest port of call of the ship.

12,244. Where is that?—Shaba, in the Persian Gulf. At the same time I sent a telegram to the Political Agent at Muscat, and requested him to send it on, which he did. The ship had four more cases of plague on the way, two of whom, I think, died, and one case was landed at Busra, and recovered. When the ship returned to Karachi, she had been 12 days clear of plague, and she had been thoroughly disinfected. I went over the ship myself, and saw everything had been cleaned up most thoroughly.

12,245. How was the ship disinfected?—With perchloride of mercury, by an Indian Medical Officer up the Gulf, assisted by a Russian Army Surgeon who happened to be on board. The *Bahaduri* was a ship coming in.

12,246. The *Bahaduri* was a ship coming in with a case of plague?—Yes.

12,247. How was she treated?—The whole of the passengers were sent ashore and detained for 10 days, except a few of them who were respectable people and whose addresses could be relied upon, but their kit was disinfected before they were allowed to go, and their addresses taken. The rest of the people, being mostly ordinary labouring people, were detained for 10 days. The crew were disinfected on board at the time. I brought the disinfectants on board, and disinfected the whole of the crew there. One of the crew had been attacked, and the ship's forecastle was very carefully cleaned out and thoroughly disinfected with perchloride. This being done, the ship was then allowed to discharge her cargo. The cargo on a ship like this is entirely separate from the crew or passengers.

12,248. Is there any danger from the cargo?—No, there is no danger from it.

12,249. Were there any cases of plague among those landed from the ship?—We had one—that man I told you about, who died so quickly.

12,250. How about the steamship *Bhandara;* can you give us any details as to that?—I have not had any particulars as to what happened to her after she left. I have received no official intimation about it at all. The measures carried out on her were the same measures as were carried out on all emigrant ships, except that lately emigrants have not been detained as before. They came straight down from the Punjab. There were practically five different sorts of people on board. There were the artisans of better class, mostly Europeans or Eurasians—well-paid men and clean and respectable people; they were allowed to go simply on the usual medical examination. Then there was a batch of 30 odd people who had been shut out from the previous ship, and they had remained in the Kiamari detention camp in separate huts of their own, which was the usual place where we used to put these emigrants, and they were sent on board under escort when the ship left. Then there was a batch that came down in a special train the night before the ship left. They remained in the Kiamari detention camp during that night. They were put on board the next morning. There were two special trains that came down direct from the Punjab.

12,251. Was the kit of these people disinfected?—The people who had been shut out from the previous ship had their kit disinfected; the kit of the other people was not.

12,252. Had there been any communication with the town?—We took into account that those people who had been in the camp might have purchased some kit in Karachi, and we disinfected the whole of their kit.

12,253. The people who embarked from the train had no communication with the town?—No, they had none.

12,254. Is it your opinion that they brought the plague from somewhere else?—I do not know that they had plague; it may have been the crew who brought it.

12,255. How about the crew?—The crew were examined on arrival, and were not allowed in Karachi.

12,256. Where did the ship come from?—The ship came from Bombay. She had a crew of 100 souls all told; she had a Medical Officer on board, and the captain was a man who had carried out emigration work before. I went round to see the crew with him and the Medical Officer, and, as it happened, they appeared to be an extremely healthy lot of men.

12,257. Was their kit disinfected before leaving Bombay?—No, I do not think so.

12,258. Was it disinfected before leaving here?—No.

12,259. Do any pilgrim ships sail from here?—We had one ship leave here.

12,260. When was that?—I forget the date—it was during the time the Malir camp was open, and it must have been in June.

12,261. What measures did you take on that pilgrim ship?—They were detained in Malir camp and a few other camps about the country until such time as a sufficient number had been gathered together to make it worth while for a ship to go. When the ship arrived she was inspected, and found to have the necessary accommodation, and the necessary hospital accommodation, and so on.

12,262. Where did that ship come from?—From Bombay, the *Cashmere*. She was found to be fitted for pilgrim traffic, according to the Pilgrim Act. The crew were very carefully examined. Dr. Niblock brought the pilgrims down himself from Malir in a special train, and they were put straight on board the ship from the train. A very careful account was kept of them, and a very careful look-out was kept in order that no other unauthorised person should go in the ship.

12,263. Were their personal effects disinfected?—Yes, they were all disinfected at Malir—everything.

12,264. That is the only pilgrim ship you have had?—Yes, and I take it they went perfectly safely.

12,265. Can you tell me whether any pilgrims sail across the Gulf in sailing vessels?—I do not think so. The Police are always on the watch for them.

12,266. I want to ask you that question because it has been raised at the Conference at Venice. Do you know whether large numbers of people leave this side, sail across the Persian Gulf, and form a caravan to Mecca?—They may leave in very small driblets but they certainly never leave in bodies.

12,267. Do you think many pilgrims go to Mecca that way?—Every now and then there is an odd man that might be suspicious, but if he is a pilgrim travelling to Mecca he is a man going to give up years to it, and he thinks that if he can get up the Persian Gulf he may be able to travel round through Turkish Arabia, but he certainly does not go with any idea of meeting or forming a caravan there—he is taking his chance.

12,268. You do not think there is any danger of plague being carried to Mecca in that way?—I should not think so.

12,269. Is there much trade between the two sides of the Persian Gulf?—Yes, there must be.

12,270. By sailing boats?—I should think so—by sailing boats.

12,271. Is there much passenger traffic?—I should not think so. The great majority of sailing boats from here do not go much further than Gwadur taking the Mekranis back to their country, and bringing back dates.

12,272. Has Manora been free from plague?—Yes, during the 1898 epidemic.

12,273. Could you tell us why?—It was infected in 1897. During that epidemic there was an extremely energetic Plague Superintendent, Major Morris, of the Karachi Artillery Volunteers, and Harbour Engineer. He carried out the measures for the ventilation of infected houses in an extremely thorough manner; very large openings were made. Most of the floors were pucka, there are not very many mud floors. Another thing about the people there is that there is a very large proportion of Europeans. Nearly every native, too, is under a certain amount of discipline; he is either a Port Trust lascar, or in the employ of the Harbour Works, or, it may be, he is in the employ of the Telegraph Department. He is looked after by some Department or other. The only people who were not actually under somebody were a few Banniahs.

12,274. Did they get plague?—Not this time, there was no plague there.

12,275. Have there been no cases of plague this year?—No cases of plague, in Manora not a single one.

12,276. I can understand your explanation that it did not spread, but how can you explain that it never got there at all?—I think it tried to go further, but could not find a foot-hold.

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12,277. Might not a case of plague come over the water?—Nobody came over there to live. We did not allow that except in a few cases. There was a Plague Committee rule in Karachi, which came in very soon after the epidemic broke out—when the epidemic began to take formidable proportions—by which nobody was allowed to change his residence without a pass from the Plague Superintendent. This pass was not given if a man came from an infected house. Even if he did get a pass he had to submit to supervision for ten days after he arrived in a new district.

12,278. I think there are some fishing villages on the west side of the harbour?—Yes, at Baba, Bhit, and Shamspir. They are scattered round the western side of the harbour.

12,279. They, too, remained free from plague?—There was a case in Shamspir. It was the case of a sweeper boy, the son of a sweeper who is kept there to clean up. It is a great fish-curing place. We have a man there to keep the place clean; and this boy got attacked with plague. Curiously enough, this boy had never been across to Karachi; but his father had a few days before he was attacked.

12,280. On the whole, did these fishing villages escape?—There were a couple of suspicious deaths in Baba, but they never spread.

12,281. Have you any facts, or theory, to explain the immunity of these villages?—The people live a very open-air kind of life. Their huts are not particularly overcrowded. They are made of very poor material—matting huts.

12,282. Have these people any communication with Karachi?—Yes, free communication by boats. They go up to Kadda to sell fish.

12,283. Would a fisherman, coming to Karachi, be likely to come into contact with a case of plague? Would he be likely to go into a house in Karachi?—Kadda is at the extreme point of the trans-Lyari Quarter.

12,284. Do you think these men might go into a house there?—The Bhit and Baba people go over there constantly in boats, and have many relations living there.

12,285. Was there any plague in Kadda?—Yes.

12,286. And in spite of that these villages escaped?—Yes, they have practically escaped.

12,287. (*Mr. Hewett.*) Pilgrims are not allowed to leave Karachi now, are they?—No.

12,288. When you say that every now and then men may possibly be found trying to get to Mecca, do you mean during the period since departure from here has been prohibited, or at ordinary times?—I mean at the present time. You could not say that the man was a pilgrim; but he is one of those men who mean to get there, and he says he is going up the Gulf.

12,289. In spite of the prohibition?—Yes, in spite of the prohibition. He is going alone. He is not going in the pilgrim season. It would take him a year to get there.

12,290. I am not certain that what you said about these emigrants is quite right. I see that a notification was issued under the Epidemic Diseases Act, prohibiting any person from being embarked with the object of proceeding as an emigrant or as a labourer to any port out of British India; that would cover emigrants not going under contract, would it not?—Yes.

12,291. So that their departure is prohibited at present?—Yes.

12,292. That was done, was it not, in the interests of the countries to which these people are in the habit of going?—Yes.

12,293. These people who went to Uganda went for the purposes of the British Government?—Yes.

12,294. You were employed for a certain time in the epidemic of 1897?—Yes.

12,295. In the Trans-Lyari district?—Yes.

12,296. Have you anything to say about your experience there?—I saw a very interesting operation there which was carried out very successfully—the evacuation of Gharibabad.

12,297. Please tell us how that was done?—When I took it over, practically a new village of matting huts had been built. It is generally known as New Kalankot. Into this the people from Kalankot had been removed, and we wished to remove them back to their reorganised village. In order to do it, and render it as complete as possible, an order was made that they were to be disinfected before they went back; so that that was the first thing to be done. These people were all collected together, and lists made by families. They were told off at different times during the day. A place was fenced out for a disinfecting station, and they were all passed through it. They were all kept in the village. When the time for the particular batch had come they were passed through this, and guarded by police over to the new village. In this way we made certain that the whole of their kit was disinfected. As far as I remember, I do not think any case occurred in Old Kalankot after the return of the people.

12,298. During the first epidemic, or the second epidemic?—The first epidemic.

12,299. Have these huts been occupied again?—The Gharibabad people were moved into camp and their old place burnt. It was a filthy place. Two cases occurred in the health camp to which they had been removed. Two cases occurred there, I think, three or four days after they had been moved in. No more cases occurred.

12,300. After these people had come into the camp did you prevent them from going back into the city?—They had to go back to earn their living. Most of them earn their living down in Kiamari.

12,301. Were the contacts from Gharibabad in the same camp?—They were all in the segregation camp. All the contacts at that time were moved into the segregation camp.

12,302. That was during the time of the first Plague Committee?—Yes.

12,303. (*Dr. Ruffer.*) You have had some experience with serum, have you not?—Yes, with Dr. Simond's serum.

12,304. Could you give us evidence as to the value of this treatment?—I had a total of nine cases treated with serum. Of these, five died and four recovered. They were not picked cases in any way. Of those that died one refused treatment altogether until the third day of illness. That gave a mortality of 55·5 per cent. among them. In every case that recovered, there was an easier convalescence than I have seen among the rest of the plague cases. The buboes suppurated in three of the cases; but there was not at all the same sloughing that there used to be in the ordinary cases.

12,305. On what day of the disease were these patients injected?—All, except that one, were injected on the first day they were discovered. We could not always say it was the first day of the disease, but I think it was.

12,306. You think it was the first day of the disease?—I think so; but I could not always be perfectly certain.

12,307. Did you notice any effect upon the temperature?—No. But of the 60 cases I had in the Manora Hospital in nearly every case the temperature sank down about the third day, whatever treatment was adopted.

12,308. You did not notice any sudden fall of the temperature?—No.

12,309. Have you any experience of other curative agents?—Strychnine and brandy. Those are the only curative agents I used.

12,310. You do not know of any specific remedy for plague?—No. Out of my last batch of 13 cases three died. They were all treated with strychnine and brandy.

12,311. (*The President.*) Can you remember what was the dose of serum ordered to be given?—There were four injections I gave in one case—20 c.c.

12,312. Is that the recommended standard dose?—It is the dose Dr. Simond recommends. That was rather more than usual—each of his bottles held 20 c.c. In the case of three injections two died and one recovered; in the case of two injections one died and one recovered, and in the case of one injection two died and one recovered; that was a fairly light case.

12,313. The four doses were the largest?—Yes. The case was injected on the third day of the disease.

12,314. At what intervals?—Two or three hours between them. It was a very severe case. I wanted to save it.

12,315. You did not think of giving more?—I had no more. I only had a limited supply.

12,316. (*Mr. Cumine.*) During the first three months of 1893 when ships with cargoes came from Bombay, where did they lie? In the stream, or in the quays?—It depends on the steamers. The British India Steamers lie in the stream, all the other ships come alongside. They bring a large amount of cargo.

12,317. Where did the native craft lie?—They are kept in the stream. They brought no medical officers; consequently they had to do ten days' quarantine. At the end of that they go up to the Native Jetty and discharge their cargo there.

12,318. How are they guarded in quarantine?—By the Harbour Police boats. We used to take occasional musters on board to find if everybody was on board. We never found anything wrong with them.

12,319. When a cargo came from Bombay, how was it got from the ship to the shore?—In the case of ships in the stream it was loaded into the cargo boats, taken up to the Native Jetty, and discharged there. In the case of ships alongside the wharf the cargo is discharged straight into the railway trucks alongside, and either taken straight away up country, or to the import yard, as the case may be.

12,320. Do you think that the infection by human agency of the people who unload can safely be excluded in those three months? Was it impossible for the people who went to unload a ship to get infected by any plague there might have been amongst the crew or passengers?—I do not think that is possible. The coolies loading a ship do not mix with the crew, they are a different kind of men. *Capt. G. W. Jenney, I.M.S.* 25 Jan. 1899.

12,321. Not in coaling, for instance?—No, I should think coaling about least of all. There is very little coaling done in Karachi. When a ship is brought alongside the wharf, or to her moorings, the crew do do not assist in removing the cargo—they do not touch it.

12,322. Was there any guard over them at night to prevent Karachi people from going on board the ships lying at the quays?—The ships were very often loaded and unloaded during night, and you had to allow people on board. With a crowd of coolies on board a ship you could not know if a man was one of a gang or not.

12,323. Crowds did go to work on board the ships lying at the quays?—They must go down into the holds of the ships amongst the cargo.

(Witness withdrew.)

Lieut. W. J. Niblock, I.M.S., called and examined. *Lieut. W. J. Niblock, I.M.S.*

12,324. (*The President.*) I believe you are in the Indian Medical Service?—Yes.

12,325. I think you have done a good deal of plague work?—I have done nearly two years' work in connexion with plague. I commenced on the 5th February 1897.

12,326. Where?—I went to Bombay on the 5th of February, and came to Karachi on the 12th.

12,327. What was the nature of the work you did in the first instance, at the commencement of your work in Karachi in February 1897?—The first work was house-to-house treatment of persons sick with plague.

12,328. What was that treatment?—We went round generally twice a day and visited persons in their own houses, and treated them with stimulants, &c.

12,329. Solely medical treatment?—Medical, including sanitary treatment.

12,330. What do you mean by that?—I got people into upstair rooms, opened all the doors and windows, and thoroughly cleansed and disinfected the house; and then I treated the people.

12,331. I understand you isolated the patients in a part of the same house?—They were not altogether isolated, because other persons in the house were allowed to visit them. There was no law against other people coming into the house at that time.

12,332. Was that a successful measure?—It was successful, I think, from the point of view of the patients themselves; but from the point of view of preventing the spread of the disease, I think it was very bad indeed.

12,333. Why do you say very bad?—Because, in the first instance, in one house where I was treating patients there were no less than 21 people who caught the disease from one another. That was in one large house in Mahomed Shah Street, in the Napier Quarter.

12,334. These were inhabitants of the same house?—Yes, all inhabitants of the same house.

12,335. Have you any case in which plague was thus spread from houses to other districts?—I know it was spread from that house to the houses on the opposite side of the street by people who had visited the house.

12,336. By human intercourse?—Yes, by human intercourse.

12,337. I believe you remained at the work only for a short time?—Until the beginning of March.

12,338. What did you change your occupation to?—Then I went to the Civil Hospital. I was in medical charge of the Plague Division of the Hospital.

12,339. You organised that hospital?—Yes, practically.

12,340. And you remained in charge of that hospital till when?—Until it was closed in August.

12,341. Have you collected the results of your experience?—Yes.

12,342. How many cases did you treat in this hospital?—I quote from a copy of the report I sent to the Principal Medical Officer. Up to the 30th June, 505 patients were treated. Up to the closing of the Plague Hospital there were 524 persons admitted. Out of these five persons absconded, and five were discharged as not having plague. That leaves 514. Out of these 308 died—a percentage of 59·9—practically 60 per cent. 206 recovered.

12,343. I think you have a statement to show the ages, have you not?—Yes, the table is as follows:—

Admissions and Mortality according to Age.

Age.	1 to 5.	6 to 10.	11 to 20.	21 to 30.	31 to 40.	41 to 50.	51 to 60.	61 to 70.	71 to 80.
Admitted - - -	21	57	100	173	93	42	20	8	1
Died - - -	7	37	60	95	56	27	16	4	1
Death percentage - -	33·3	65	60	54·9	60·2	64·3	80	50	100

12,344. Generally speaking the case mortality was lowest at what period of life?—The case mortality was lowest in infancy—from the ages 1 to 5, 33·3 per cent. We found it worst at the ages of from 51 to 60.

12,345. And above that age?—From 61 to 70 the death-rate was only 50 per cent., but the numbers were small.

12,346. I think you have a similar statement with regard to sex?—It is not complete. There were 339 males, 92 females, and 84 children up to and including the age of 12 years.

12,347. There was a great preponderance of males?—That may partly be due to the fact that they did not like to bring the females to the hospitals.

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12,348. I should like to have your explanation of this preponderance. What are the possible causes?—In the Malir Camp Hospital, to which all the persons who there contracted the disease were admitted, there were 97 males, 16 females and 7 children. My experience is that men are affected the most.

12,349. Why do you think that is so?—The men go about more, for one thing. The women are more confined to the house, and do not go about so much.

12,350. You think the incidence of plague falls chiefly on the male sex?—That has been my experience. Of course these are my personal experiences. I cannot answer for Karachi as a whole.

12,351. You have no reason to suppose that cases of plague among women are concealed?—I do not believe so.

12,352. Have you good reasons for your belief?—I have never myself discovered them. I have never found them out trying to hide females any more than males. That is my only reason. I cannot say that they actually do not do so.

12,353. If they had been doing so you would have probably heard of it?—Yes.

12,354. You think it is owing to a difference of occupation that men are more subject to the infection from plague than women?—It is possible.

12,355. That is the explanation you give?—It is the only explanation that occurs to me. I do not say it is the correct one.

12,356. With regard to caste, what is the incidence?—Musalmans, 130 admissions; Hindus (including low caste Hindus and sweepers), 351; other castes and religions (which include Jews, Christains, and Parsees), 34.

12,357. Do those figures in any way correspond with the relative numbers of these different groups in the population of Karachi?—I should not like to say.

12,358. They may correspond entirely so far as you know?—There is no reason why they should not. Of course the number of Parsees and Jews in Karachi is small compared with the numbers of Hindus and Musalmans, and the Parsees live in the better part of of the town and are cleaner in their habits.

12,359. Will you give us the results of your observations as to the methods of infection?—I believe the disease is—in the majority of cases—caught through minute abrasions of the skin. In pneumonic cases I believe it is caught through breathing infected air—breathing bacilli—into the lungs.

12,360. Have you any definite evidence in favour of the introduction of infection through the skin surface?—In the so-called carbuncle cases. We had ten cases in which the persons suffered from what is often called plague carbuncle. In these cases, as far as I could make out from the history, it begins with a small pimple on the skin. This is the history the people themselves give. Afterwards it takes the form of a small blister which becomes purulent, then this undergoes rapid necrosis. In those cases the patients themselves—those who were intelligent and able to give a reliable statement on the subject—said that the pimple appeared at the beginning of the disease. They noticed this at the very beginning. I noticed on their coming to the hospital that the lymphatics leading from this were inflamed in a number of cases; and also that the buboes which appeared afterwards were in the glands into which the lymphatics of the area drained.

12,361. You observed this, I believe in ten cases?—Yes.

12,362. Will you tell me in what parts of the body these superficial appearances were seen in these ten cases?—On the abdomen, there were two.

12,363. What lymphatic glands were affected?—The glands above Poupart's ligament.

12,364. The lymphatic canals?—In these first two cases. I do not say the lymphatics were inflamed in all the cases—in some.

12,365. In this instance the mark was on the left side of the abdomen?—To the left of the umbilicus. The buboes were in the line of Poupart's ligament, on the same side.

12,366. What was the second case?—The second case was a case in which it occurred in the left lumbar region. The bubo was in the oblique glands on the same side.

12,367. The third case?—We had two on the neck. The glands immediately underneath on the same side were enlarged. The other glands all became enlarged a short time afterwards—in the two cervical cases.

12,368. The glands on both sides of the neck?—Yes.

12,369. Where do you say these little carbuncles were?—The first case I have here was that of a man who had one of these carbuncles on the centre of the right forearm, on the anterior aspect. There was a hard tense bubo in the right axilla. The next is the case of a policeman, and it is rather interesting as bearing on the question of incubation. He had an injury on the dorsum of his foot—an abrasion on the upper part of the foot. The lymphatics leading from this up the leg became inflamed, and a bubo appeared in the vertical row of the glands on the same side. The next was one on the abdomen, 2 inches to the left of the umbilicus. The bubo became enlarged on the same side, in the inguinal row of glands—the oblique row. The next case was that of a man who had got an injury on the outer and posterior aspect of his left leg.

12,370. What do you mean by injury?—This was his statement. When he came in he had a vesicle about the size of a 4-anna piece on the outer and posterior aspect of the left leg. He had a bubo on the vertical row of glands on the same side, and also in the oblique—both vertical and oblique. The fifth case was one in which there was a carbuncle on the abdomen, to the left of the umbilicus. In this case the bubo appeared in the oblique row of the same side. The sixth case was that of a man who had a typical carbuncle, the anterior edge of which was on a level with the front of his right ear, situated below the ear. The glands on the same side were very much enlarged—the submaxillary glands. There was enormous swelling on that side. The next case was one in which, just over the inner malleolus, on the left leg, there was a vesicle. There were the ordinary appearances of carbuncle in this case. Some of the serum which it contained was examined under the microscope, and it was found to contain bacilli answering to the appearance of the plague bacillus. In this case the lymphatics leading from the vesicle were inflamed, and the bubo appeared in the vertical row of inguinal glands on the same side. In the next case the carbuncle was in the left lumbar region, half-way between the iliac crest and the ribs. The bubo appeared in the oblique row of inguinal glands on the same side. In the last case the carbuncle appeared on the dorsum of the foot, and the vertical glands of the groin on the same side became enlarged. Those are the 10 cases. Then there are two or three others showing the probable point of inoculation, but not of typical character as in the above cases.

12,371. You looked for such points of inoculation; what did you find?—One man had a bulla on the right ankle over the inner malleolus. There was thick skin over it. It contained reddish serous-looking fluid. The base was hard, and it had no brawny infiltration round it. There was no œdema, such as is generally seen in these cases. This man had a bubo in the vertical row of inguinal glands on the same side.

12,372. Was there any appearance of inflammation of the lymphatics?—Not in this case. The next case was that of a man who came from a very infected quarter of the town. He had a large tense bubo on the right side; both inguinal and femoral glands were enlarged. There was a vesicle over one of the buboes. It was at once opened, and a serous fluid escaped. I should not like to say that that was on the point of inoculation. We have a number of these cases. The next case was that of a man who had a bubo on the left axilla, about the size of a hen's egg. He had got diffuse inflammation and swelling along the inner surface of the left arm, extending from about 2 inches above to about 2 inches below the elbow joint. There was swelling along the inner side of the elbow, showing a possible spread by the lymphatics which caused the inflammation at that point. The next case was that of a man who had a bubo the size of a pigeon's egg in the left axilla, with a blister the size of one pice situated just external to it. This also contained a serous-looking fluid. In another case there was an enlarged bubo in the left groin, with a vesicle over it, containing serum.

12,373. You spoke about carbuncles. Will you describe what you mean by a carbuncle? What were the appearances?—I could describe one or two of the cases which suffered from it. In the first case we saw we could not find how it began exactly. When we saw the carbuncle it was dark in the centre, 2 inches in diameter, with the skin round it extremely tense and painful, and considerable swelling.

12,374. Was it tender?—Yes; and had a great deal of œdema surrounding it. I put this man under chloroform, and scraped it out immediately. The subcutaneous tissues were alone affected; the muscles were not affected at all. The material was of a peculiar colour, like anchovy sauce. The skin immediately around was necrosed and extremely hard. The next was a case seen by the Civil Surgeon almost at the beginning. He was an intelligent man, a Parsee, the head clerk of the Telegraph Office. On admission he was quite conscious, and said he got fever three days before, and noticed about the same time a little blister over his abdomen. He said that a pimple first appeared, which turned into a blister. The pimple came out on the 15th instant. The blister was opened at his own house by Dr. McCloghry on the morning of the 19th instant, and a small quantity of serum escaped. Dr. McCloghry thought the case suspicious, and had him at once removed to the hospital. The man was removed to hospital on the evening of the 19th, at 6·40 p.m. About 2 inches on the left of the umbilicus, and on the same level, there was a rawish surface where the blister had been opened in the morning; rather dark in colour, hard, and very painful. It was about the size of a pice, and surrounded by diffused inflammation, with the edge brawny to the touch. He had also a bubo in the left groin. the size of a pigeon's egg, in the oblique inguinal row. This was on the evening of the 19th. On the morning of the 20th it was the same size as the night before, but the inflammation showed an appearance of extending. On the 21st a large amount of brawny infiltration was present round the raw spot. On the morning of the 22nd it had fully developed, and the necrosis was well marked, and had extended about a quarter of an inch all round, quite black, and hard, and with a deep red circumference.

12,375. You examined cases bacteriologically?—We examined two cases.

12,376. What is the result of the examination in the second case?—We had a Russian doctor, Dr. Marc, who made cultures with this, and found typical plague cultures.

12,377. Can you refer to the case?—It is one of the cases I have given you. There was a vesicle over the inner malleolus on the left leg. The other case was a man who got an injury on the dorsum of his foot. In this case we examined some of the serum under a microscope, and we found bacilli which resembled the plague bacilli.

12,378. You did not examine by cultures?—No, we had not the necessary apparatus.

12,379. Now with regard to the question of incubation?—Last year the majority of the persons who came to me, who were sent from segregation camps, and who developed the disease, did so within the first two days. One case developed the disease after having been eight days in the camp.

12,380. What do you think that shows as to the minimum period of incubation?—That shows the ordinary period; it does not show the minimum or the maximum. The case of a policeman admitted to the Plague Hospital on the 27th April is interesting as showing a short incubation period. A mounted constable in the same lines died on the 18th April from the pneumonic form of plague. On the 26th April, at noon, the constable whose case I observed received a kick from a horse, causing a contused wound on the dorsum of the right foot, with abrasion of the skin. Bleeding was slight. He was admitted to the Civil Hospital on the same evening. The first policeman died of plague on the 18th in the same compound, with the pneumonic form of disease; and the second policeman was admitted to the hospital on the 27th. The injury was said to be slight. On the morning of the 27th he complained of severe pain in both groins, and the lymphatic glands were found enlarged and tender, more so on the right side. I may say that these glands were in the vertical row. The temperature was 104·7.

12,381. Was that a plague case?—He had a plague appearance.

12,382. Did you diagnose it as plague?—This was one of the cases in which we got the bacilli afterwards under the microscope.

12,383 What do you infer from that as to the period of incubation?—The period of incubation there, I should say, was under 24 hours, so far as I could see. The probabilities were that he acquired the disease through the wound in the foot. The corresponding glands were enlarged, the lymphatics leading from the wound were inflamed, and we got the bacilli from the wound.

12,384. Where did he acquire the disease?—From the first policeman in the compound.

12,385. Only after the injury to the foot?—Yes; he was in good health before, he said.

12,386. Was he not in contact with other people with plague considerably before this?—He might possibly have got it in that way.

12,387. Have you any other case?—There was no *post-mortem* examination held in the second case, but it was rather peculiar. A policeman was admitted to the police ward in the Civil Hospital on the 1st February 1897, suffering from fever of intermittent type, and complaining of sore throat. On the 4th of the same month a swelling of the cervical glands developed with rise of temperature to 105 degrees; and he died on the same night. In the same ward there was another policeman, admitted to the hospital on the 12th January for phthisis. On the 6th February, five days after the admission of the case of plague, this man had a sudden rise of temperature to 106 degrees, with violent delirium, and he died the same day. This was a case of within five days incubation period.

12,388. Did he die of plague?—There was every appearance of plague, but there was no *post-mortem* examination.

12,389. What appearance?—I did not see that patient myself, but I was told that he had a plague appearance. He had no buboes.

12,390. Have you any other cases?—No, those are the only ones.

12,391. I suppose you agree with the general view that there may be bubonic, pneumonic, and another variety, sometimes termed septicæmic plague?—Yes.

12,392. Do you also agree with the view that the mortality is greatest in the septicæmic cases?—Yes.

12,393. Next the pneumonic cases, and, lastly, the bubonic?—Yes.

12,394. Have you any facts with regard to the comparative death-rates of each variety in the different sexes, and in children?—Yes, these are the figures. I put in the following tables.

STATEMENT showing PERCENTAGES DEATH-RATE according to SEX in DIFFERENT VARIETIES of PNEUMONIA.

		Men.		Women.		Children.	
		Per cent.		Per cent.		Per cent.	
Primary Pneumonia	Double	65·8	69·8	50	60	100	100
	Single	80		75		100	
Secondary Pneumonia	Double	54·2	61·9	80	55·5	—	10
	Single	72·2		25		100	

Of the total number of cases 14·7 per cent. had primary pneumonia (68 in 461).

These were distributed amongst sexes according to following percentages:—

Men.		Women.		Children.	
77·9	Double 80·8	14·7	12·8	7·3	6·4 of total cases of double pneumonia.
	Single 71·4		19·0		9·5 of total cases of single pneumonia.

Lieut. W. J. Niblock, I.M.S.

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STATEMENT showing COMPARATIVE DEATH-RATES in DIFFERENT VARIETIES of the DISEASE in the DIFFERENT SEXES and in CHILDREN.

		Men.			Women.			Children.			Total.
		Died.	Recovered.	Total.	Died.	Recovered.	Total.	Died.	Recovered.	Total.	
Primary Pneumonia	Double	25	13	38	3	3	6	3	0	3	47
	Single	12	3	15	3	1	4	2	0	2	21
Total		37	16	53	6	4	10	5	0	5	68
Secondary Pneumonia	Double	13	11	24	4	1	5	0	0	0	29
	Single	13	5	18	1	3	4	1	0	1	23
Total		26	16	42	5	4	9	1	0	1	52
BUBOES.											
Groin		79	73	152	31	26	57	19	13	32	241
Iliac		2	2	4	0	0	0	0	0	0	4
Axilla		17	12	29	5	10	15	12	4	16	60
Neck	One side	5	3	8	4	5	9	5	12	17	34
	Both sides	4	1	5	1	1	2	4	0	4	11
Multiple		7	3	10	2	1	3	3	2	5	18
Total		114	94	208	43	43	86	43	31	74	368

Of the total, 200 died and 168 recovered.
Deaths, 54·3 per cent. Recoveries, 45·7 per cent.
All the septicæmic cases died.

12,395. Have you any statement to show the relative frequency of the enlargements in different situations?—Yes. There were 461 cases recorded by me: buboes occurred in 372; buboes in the groin occurred in 224; that is, in 60·2 per cent. of bubonic cases.

12,396. The groin was chiefly affected?—Yes. The axilla was next, 60 cases; the neck 45; and multiple (that is, glands appearing in several parts of the body at one time) 39; iliac region 4.

12,397. Is there any difference of sex in the distribution?—It is the same in men and women, but in children the neck is more commonly affected. Half of the cases of cervical buboes occurred amongst children under 12.

12,398. What are the main symptoms to which you trust for the diagnosis of plague?—When a person comes in he has a peculiar facial expression not easily described. It is often described as a kind of anxious expression—I do not know that that describes the thing at all. The conjunctivas are generally hyperæmic, the tongue is narrow with a thick white fur in the centre and pinkish red on the tip and edges. The pulse is generally small and easily compressible and frequent. That is the general variety, but there are other varieties. Some of the patients are described as having a full pulse on admission to the hospital. A large number of them were taken by the Hospital Assistant, and I did not see these. I could not be responsible for the recorded description of their pulse. The temperature is generally between 100 and 103. The patients complain of frontal headache, and through the epidemic of 1897 it was a common thing for the disease to commence with bilious vomiting and bilious diarrhœa. That was the usual commencement. They may or may not have a bubo at the beginning. I have seen buboes appear before the fever, although the general rule is for them to appear in the first three days after the fever commences. The breathing is generally hurried.

12,399. In all varieties?—Yes. The voice is rather peculiar, disconnected, and slurring, like that of a drunken man.

12,400. Have you met with any cases in which there was actual aphasia?—We had eight cases of absolute aphonia, but I cannot say there was aphasia. They recovered from it afterwards.

12,401. Was the aphonia absolute?—Yes, in these cases.

12,402. Did you generally find partial aphonia?—Not always, but as a general rule.

12,403. Have you seen anything in the nature of œdema of the surface?—It was very rare. I saw one case of a very large bubo in the axilla where there was oedema of the corresponding side of the chest.

12,404. Limited to the same side?—I have not seen general œdema.

12,405. You have not seen œdema involving the anterior aspect?—No.

12,406. Have you seen patients shortly before death?—At all stages.

12,407. And after death?—Yes, and I have never seen œdema confined to the anterior part of the body yet.

12,408. Have you seen much œdema at all?—I have seen œdema of the limbs—ordinary œdema of that description.

12,409. Have you met with albuminuria?—Only in a few cases; it has not been the rule here.

12,410. Have you had any appearance of jaundice?—At the beginning of the epidemic it was very frequent in their homes; it seemed to be more frequent there than in hospital. At the beginning they had jaundiced conjunctivæ.

12,411. What was the condition of the spleen?—Much the same as usual. The natives often have large spleens.

12,412. And the liver?—The liver was the same. In some cases it was enlarged, and in others small, but not more so than it would be ordinarily.

12,413. Are there any conditions which allow you to form a prognosis?—I think it is difficult to give a prognosis of the disease, as there are often cases which seem to be getting on well which turn out badly. I have often been taken in in that way. Other cases which I thought would not recover did recover. Cases with very bad prognosis are:—(1.) Pneumonia in children always proved fatal. We had six cases of plague pneumonia among children, and they all died. (2.) Cases with buboes on both sides of the neck—diffuse, soft variety—almost invariably proved fatal. (3.) Cases in which coma occurred, as a rule, proved fatal. (4.) Cases in which hæmorrhage occurred—epistaxis, hæmatemesis, &c.—generally proved fatal. Then under the heading serious prognosis I include:—(1.) Cases with marked nervous symptoms, such as delirium or convulsions. (2.) Cases of pneumonia with or without hæmoptysis. (3.) Where the pulse was intermittent, dicrotic, very weak or irregular. (4.) Cases with very severe diarrhœa. (5.) All the cases with carbuncle were very severe. Under the heading of fairly good prognosis are:—(1.) Cases in which the nervous symptoms were slight or absent; they generally recovered. (2.) Cases in which inguinal buboes were present were often of a mild type. (3.) Cases with obstinate constipation almost invariably recovered. (4.) A regular full pulse is of a very favourable import. One does get a good pulse in some cases, but it is very rare. When you do get it the chances are the patient will recover. I noticed that fat persons in a very large number of cases had a worse chance of recovery than others, and also that smoking was very injurious. I put in the following figures with regard to special symptoms; out of 100 consecutive fatal cases, and 100 consecutive recovery cases, special symptoms occurred as follows:—

Nervous.

	Conscious all through.	Delirious.	Comatose.	Unconscious.	Semi-conscious or Rambling.	Semi-Comatose.	Total.
Fatal Cases	7	50	14	14	8	7	100
Recoveries	51	29	2	5	12	1	100

	Diarrhœa.	Constipation.	Vomiting.	Hiccough.
Fatal Cases	36	15	36	6
Recoveries	20	42	28	2

No hæmaturia. No petechiæ.

12,414. What are the extremes of duration in fatal cases?—They may die from exhaustion; in cases where the glands suppurate the patients may live for months.

12,415. Putting aside any cases like that what are the extremes of duration in a fatal case?—Persons who do not die during the first five days have a good chance of recovery.

12,416. The fatal case generally would be within five days?—Yes. I have not the figures with me.

12,417. And the minimum?—It is very hard to give that. I could give you the exact number who died within 24 hours after admission.

12,418. Is 24 hours the shortest?—No, but it was very difficult to calculate exactly how long the patient had actually been ill. We have had them die immediately after admission.

12,419. I mean in the cases when you knew when the first symptoms occurred?—It is very hard to say when the first symptoms occurred. The number of deaths in the first 24 hours after admission was 102 out of a total of 303; that is practically one-third. Eighty-one died during the second 24 hours; in other words 60·4 per cent. of fatal cases died within 48 hours after admission. The chances are therefore in their favour when they live beyond the first two days.

12,420. Do you find much benefit from any treatment you have adopted?—I believe strychnine is very good, and helps the patients to get over the disease. The effect on the actual mortality is very slight.

12,421. Not appreciable?—No.

12,422. How did you treat the local conditions?—We treated the local conditions and symptoms as they arose, in the ordinary way, *e.g.*, pain with morphia, delirium with hyoscin, &c.

12,423. You have a history of a large number of cases, I believe?—I have a history of 460.

12,424. Can you let us have access to them?—With pleasure.

12,425. You had also a considerable experience afterwards in the Malir camp. Is there anything you would like to say about this camp?—We did not allow any of the persons detained to leave the camp at all during their ten days' segregation in the camp.

12,426. And they were not allowed to go home?—They were not allowed to leave the camp at all.

12,427. What was the result as far as those who were in the camp were concerned?—I believe we had no local cases of plague in the camp.

12,428. And no infection occurred in the camp?—I believe not.

12,429. How many people in the camp had you altogether?—During the three months when plague was very bad in Karachi we admitted 7,925 people to the camp, *i.e.*, during April, May, and June.

12,430. Among these how many cases of plague were there?—Amongst the travellers by rail from Karachi, 108 cases.

12,431. Were they taken into the camp already suffering?—Thirteen were taken actually suffering.

12,432. And the others acquired it within what time?—All within ten days.

12,433. Have you any other cases?—From the surrounding country there were 18 taken in; of these nine were discovered amongst persons trying to escape from Karachi by road. They were prevented from doing so by a cordon.

12,434. How many of them had already shown symptoms of plague?—Nine of them had it at the time. The people were trying to take the sick with them up country. The others whom we took in to treat from the surrounding villages were not trying to escape.

12,435. They were already affected?—Yes. They were living outside the camp in the vicinity.

12,436. They had plague when you took them in?—Yes.

12,437. Were there any more cases?—Those are all.

12,438. So far as you know, no single case has occurred in this camp from a fresh infection?—I believe not.

12,439. What is your opinion about the success of your arrangements, was the result good or bad?—I believe the results were good.

12,440. To what particular circumstance in your arrangements do you attribute the good results?—One Hospital Assistant was employed in the main camp all day, whose duty was to constantly keep going round the different huts and tents, in order to find out whether any suspicious or plague cases were in camp. A second Hospital Assistant and the nurse also made use of any spare time at their disposal in the same way. When a person was discovered to have a slight rise of temperature, although not otherwise suspicious, he was removed to the observation camp, and the occupants of the hut kept under observation, without removal. If he had a high temperature, or if his case looked suspicious, but no actual symptoms of plague were present, he was removed to the hospital, and the other occupants of the hut to the observation camp. The hut was disinfected with solution of perchloride of mercury, and the roof removed, to prevent persons from living in it. If the patient afterwards developed symptoms of plague, the hut was not re-occupied for at least a fortnight, and was kept vacant as long as possible. All the other occupants of the hut were detained ten days from date of removal to observation camp, if the case turned out to be plague. When a case of plague was discovered in a hut, the patient was at once removed to the Plague Hospital. All the occupants of his hut (except those who accompanied him to hospital as attendants) were disinfected with all their kit, and taken to the observation camp. They were detained ten days from date of case. The walls and roof of the hut, with any infected bedding, &c., were burnt at once, and the floor of the hut drenched with perchloride of mercury solution (1 in 1,000). The occupants of the hut on each side were disinfected with all their kit, and detained for ten days from date of case, but remained in the main camp. Their huts were well sprayed with perchloride of mercury solution, and the roofs removed. The further detention of the people in the hut on each side may seem harsh, but it was thought advisable to err on the side of safety. When the detenus saw that they were saved such an amount of worry and extra detention by reporting before actual plague symptoms occurred, they became keen on reporting the slightest rise of temperature or sickness, so that early information was almost always forthcoming. All suspicious cases were immediately reported to me by the Hospital Assistants, and examined by me. All persons in the observation camp were examined at least three times daily, and all those in the observation hospital every few hours.

12,441. What sort of cordon did you require to prevent people leaving the camp?—We had a large thorn fence round the camp, 5 feet high and 4 feet deep, to start with. I can give you the exact number of police and sepoys, if you wish. From the 1st April to the 5th May we had a Havildar and 12 men belonging to the First Bombay Grenadiers. On the 5th May they were relieved by one native Commissioned Officer and 21 non-commissioned officers and men of the 29th Bombay Infantry. On the 27th August those were further reduced. We had also 2 naiks and 12 constables of the Karachi Police.

12,442. At any one time, when the camp was in fullest occupation, how many men were required?—Thirty-six men was the greatest number.

12,443. Did you find them sufficient?—I should have liked to have had more, but we had to do with them. Only six persons absconded from the camp during those three months, four of whom were recaptured by the police; the others probably returned to Karachi.

12,444. Was the thorn hedge of much assistance?—We found it so.

12,445. It would have required a much larger number of men if it had not been for the hedge?—Yes.

12,446. You had some experience of plague in some other villages, did you not?—Yes, in the village of Reri. This village was situated four miles from the camp, and contained about 500 inhabitants. In April, before there was any infection of the village, I warned the Patel not to allow any runaways into his village, and he very carefully followed that advice. There were four Banniahs' shops in the village. Two of the shops were owned by five partners, all men aged between 20 and 35. They also owned a shop in a small village called Sharafi. These Banniahs had two servants—young men—and all were in the habit of going to Karachi, to the Joria Bazar, to buy provisions. On the 21st May one of the servants was brought to the camp suffering from plague, and he died in three days. The other servant developed plague in Sharafi on the

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23rd May, and died on the same day. Both servants had returned from Karachi on the 19th May, after having stayed three days and three nights in the Joria Bazar, which was the worst infected part of Karachi at the time. On the evening of the 24th May four of the partners were admitted to the camp hospital suffering from plague. The fifth ran away, but was subsequently captured by the police, and was found to be suffering from plague. Three of the men died. The police locked up the shops. One dead rat was found in the shops. There were no other persons living in the shops. I visited Reri on the morning of the 25th (*i.e.*, the next morning), and found the shops in a most filthy state, dirty clothes being mixed up with grain and other eatables. No dead rats could be found after a most careful examination, nor were any discovered in the village at any subsequent time. The two other Banniahs' shops were very dirty, but had no connexion with the former; they were rival firms. I ordered the Banniahs in the other shops to evacuate them at once, and go and live in huts outside the village. This they did, and there carried on their business as usual. There was no appearance of infection among the other Banniahs, and therefore we did not disinfect them. I wrote to the District Magistrate for permission to burn the infected houses and their contents. On the 27th May two cases occurred amongst the Musalmans in huts quite distinct from one another, and a long way from the Banniahs' shops. They were both residents of the village, and had not been to Karachi for months. One was a boy, and the other was a girl—not relatives. They were at once removed outside the village, along with the persons who lived in the same huts. On the 28th, having received permission from the District Magistrate, I had the shops and their contents (with the exception of cooking utensils, weights, and scales) burnt. The other infected huts were also disinfected thoroughly, and all clothing, &c. disinfected or burnt.

12,447. Do you know if these people had been buying things from the Banniahs?—The Banniahs supplied the village. Of course the other Banniahs also supplied them; but I found that these people had bought their eatables and grain from those particular Banniahs. All the rubbish was burnt. The relatives were allowed to return to the village 10 days after the recovery of the patient; that is, within less than four weeks.

12,448. Did you evacuate that village?—No, we simply evacuated the infected huts of the village.

12,449. And no neighbouring huts?—No. There was an area around the huts—they were a certain distance from the neighbouring huts—about 5 or 10 yards. The persons in the hut in which the person died were allowed to return to their hut within two weeks afterwards, and they reoccupied the same hut after thorough disinfection; and no further cases ever occurred in the village. In Asu village there was more chance of contamination from Karachi, because there was a large number of Banniahs in it. This first village was about 16 miles from Karachi.

12,450. Do you know how far Asu is?—Asu is 12 miles from Karachi.

12,451. Will you give us a similar account of your experience there?—Asu village is not such a good case. It has about 500 inhabitants, chiefly Mekranis. They are very dirty. Plague broke out amongst the Banniahs, the first case being on the 25th April. I was unable to localise the hut in which the case occurred, as the patient had been removed during the night outside the village. About 11 other cases occurred, some of whom were taken to camp, all Banniahs. It was confined to the Banniahs. Although those Banniahs supplied the village, none of the Mekranis took the disease, and they were constantly going in and out of the shops.

12,452. Where did the Banniahs replenish their stores from?—From Karachi. A number of the cases that occurred in the village had actually come from Karachi. We could not keep them out.

12,453. What measures did you take?—On the 3rd of June a case was discovered in a Banniah's shop, which I suspected before as being the source of the mischief, but could not until then prove it. The owner of this shop owned two others close to it. I removed all occupants of the three huts to camp at once. These were about 20, and I had all their kit taken to camp, where it was thoroughly disinfected. All dirty articles, boxes, &c., along with the huts, were burnt as they stood, the roof having been thrown on to the floor and set fire to. No further cases occurred in either.

12,454. And up to the present time?—There have been no further cases.

12,455. Latterly you have been acting as Plague Superintendent?—Yes, in a non-infected part of the town.

12,456. Supposing a case of plague were to occur, what measures would you now adopt?—Plague has been practically confined to a certain class of people during the last few months, Cutchi-Menons, who live in the Garden Quarter. Almost all their compounds are within an area surrounded by four roads or open spaces—two sides by roads and the others by spaces. I was not here when the first case occurred among them, but I believe, when a case occurred, the compound in which those people lived was evacuated, and the people were sent across the Lyari without disinfection. The houses in which they lived were locked up, and they were allowed to go back and use their compounds during the day.

12,457. But not to enter the houses?—They were not allowed to enter the houses. Then some cases occurred in the camp; and other cases have been occurring in the other compounds.

12,458. If plague were to occur in the district with which you are directly concerned, what are the measures you would adopt?—I should evacuate the entire block in which the case occurred.

12,459. Your directions are to do that?—Yes, in order to get a wide space all round. According to the present regulations, these people are allowed to go beyond the river Lyari, and live anywhere they please.

12,460. They are not sent to any special camp?—They can build their own camps. No disinfection is carried out when they leave the place, but they are not allowed to reoccupy their houses for two months. Those are the present regulations.

12,461. What is done with their huts in the interval before they are allowed to reoccupy them?—According to the present arrangements the houses are kept vacant, nothing is done with them.

12,462. They are not opened up to let in light and air?—The sunlight could not get at them, it is impossible in my quarter.

12,463. Are there any holes made?—There are inner rooms and downstairs rooms where the sun could not possibly get.

12,464. The houses are left simply empty?—Yes, for two months.

12,465. And locked up?—Yes.

12,466. They are not disinfected?—No. The people are allowed to return in two months.

12,467. (*Mr. Hewett.*) What do you do with the sick and the contacts if you have any?—They are allowed to remove their sick and contacts across the Lyari with them into the camp.

12,468. (*Dr. Ruffer.*) How do you distinguish between plague pneumonia and ordinary pneumonia?—The history of the case is a very important factor. For instance, we learn if a person has come from an infected hut or compound where other cases are occurring. The disease is remarkably severe as a general rule. Consolidation occurs very rapidly and the onset of the disease is accompanied by bilious vomiting, headache and diarrhœa.

12,469. May you not get all these symptoms in ordinary pneumonia?—Yes. I would not like to say positively that all the cases of pneumonia admitted to the hospital were plague cases.

12,470. What is the total mortality among your pneumonic cases?—The total mortality amongst pneumonic cases was 70·5 per cent.

12,471. Is not that a very low mortality for plague pneumonia?—Yes. Up to and including the 30th April the mortality was 86·4.

12,472. I think in certain figures which you have handed in you give the mortality as 64 per cent.?—The figures there refer to the different varieties.

12,473. What is the total mortality for plague pneumonia there?—69·8 in men.

12,474. Is not that very low?—It is very low. In women it is 60 per cent., and in children 100 per cent.

12,475. Do you think that some cases of ordinary pneumonia may have possibly crept into your statistics?—Yes. We had no means of telling that some cases

were not ordinary pneumonia without microscopical examination, and by cultures.

12,476. You think it is essential for the diagnosis of primary plague pneumonia or even secondary plague pneumonia, that you should have bacteriological or at least microscopical examination?—I believe so.

12,477. And you think a certain number of your cases may not have been plague pneumonia?—Judging by their mortality rate, and comparing it with the mortality rates which I see recorded elsewhere, I think it is possible some of them may not have been plague cases. But these people came from infected houses.

12,478. Do you know whether it is a generally accepted fact that the mortality from plague at ages between 50 and 60 is very high?—I could not say. That is simply my own experience.

12,479. How many people were living in the house in which you had 21 cases of plague?—I should say from 35 to 40. There was no record of the exact number kept.

12,480. The plague practically cleared half the house?—Yes, practically.

12,481. Do you think the septicæmic form is highly infectious:—by the septicæmic form I mean the form without bubo or primary pneumonia?—It is possible it may be highly infectious, but cases generally die so rapidly that there is not much time for infection. I do not see why they should be specially infectious.

12,482. Do you think the ordinary bubonic form is infectious?—The two Musalmans in Reri were infected from the Banniahs, and they had only the bubonic form of disease there.

12,483. They died?—The majority of the Banniahs died.

12,484. These cases were infectious?—Yes.

12,485. Why do you think they were infectious?—We have not made any experiments.

12,486. What do you think was the cause of the infection there?—These people are very dirty in their habits. It was not directly from the bubo, so it must have been either from the sputa or the excreta, but I could not prove it.

12,487. In the cases with primary carbuncles and buboes did you always find the lymphatics enlarged?—Not always. I should say in about half the cases.

12,488. You said something about children frequently showing the cervical form of the disease?—A large number of children have.

12,489. Do you find many children suffer from cutaneous diseases of the scalp?—I have not had any experience amongst natives in India outside plague. I have been on plague work practically all my service.

12,490. In the children which you observed, did you find lesions of the scalp, tinea, or any other similar disease?—I did not notice it particularly. I have noticed tinea in a few cases.

12,491. Were moribund cases taken to the hospital?—We took all varieties.

12,492. Even when dying?—Yes.

12,493. That would account for the large mortality?—Yes, in the first 24 hours.

12,494. Is that a good plan, or do you think it frighten people away from the hospital?—I think it is a very bad thing to take a moribund person from a house to the hospital. The simple fact of taking them to the hospital does them harm. Whether it is the shaking up, or the fear, I do not know, but it has a very bad effect on the patient. I have seen a patient in his own house and accompanied him to the hospital, and seen him after he arrived, and I should say his chances of his recovery were reduced by 50 per cent. by going to hospital, judging from his appearance alone.

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12,495. Do you think that it frightens the friends?—I am sure it does. Of course, a moribund patient would probably be dead when he got to hospital. I have seen several brought in dead.

12,496. Did you have a roll-call in your camp?—In the Malir camp we could not have a roll-call.

12,497. How did you ascertain the number of people present?—We had a roll, but we did not call it daily.

12,498. You said only six people escaped; how did you ascertain that?—By the admission and discharge book. The name of every person who entered the camp was entered in a book with full particulars concerning him, and when he was discharged from the camp he was ticked off and got a certificate stating that he had been in the camp for a certain number of days.

12,499. Do you think they ever substituted one man for another?—That is possible.

12,500. Do you think it is done?—It may be done. I think anything is possible in this country.

12,501. You referred to some cases having an incubation period of 10 days?—Yes.

12,502. Can you give us the details of those cases?—I did not write out the details, but I made careful inquiries.

12,503. Were the people disinfected on coming into camp?—All persons who came into camp were put into special huts before being allowed to go into the main camp, and were thoroughly disinfected, together with everything belonging to them.

12,504. Can you absolutely exclude the possibility of the cases with an incubation period of 10 days having been infected in the camp?—So far as I know they did not come in contact with any cases of plague in the camp. The relatives of these particular cases, as a matter of fact, were not affected at all, nor were the people with whom they would be likely to mix.

12,505. You are satisfied there are cases with an incubation period of 10 days?—I believe there are cases longer than 10 days.

12,506. Can you give us notes of such cases?—Dr. Rainier has some cases.

12,507. Have you yourself got notes of such cases?—These are the only cases.

12,508. (*The President.*) I understand you have given us some of those cases?—Yes; I have not got the details, because I had not time to write them out.

12,509. Are they procurable?—They are not procurable.

12,510. Do you think there has been any change in the virulence of plague while it has been under your observation?—The last cases which I saw were very virulent cases indeed, just as virulent as the first cases.

12,511. You have seen epidemics subsiding?—Yes.

12,512. And during that subsidence the cases seemed to be as virulent as at the origin?—The illness is just as severe—the case itself.

(Witness withdrew.)

Mr. GIDUMAL LEKHRAJ called and examined.

Mr. Gidumal Lekhraj.

12,513. (*Mr. Cumine.*) You are an Assistant Surgeon, I believe?—No, I am a volunteer on plague service, and not a Government servant.

12,514. Were you in Karachi on plague duty?—Yes.

12,515. When did you go on duty here?—About the end of April.

12,516. How long did you remain?—While the plague lasted.

12,517. Are you on duty still?—Yes.

12,518. What was your particular duty?—To assist the Plague Superintendent.

12,519. Of which ward?—The Old Town, Machi Miani, and the Bandar Quarters.

12,520. What were your duties?—Some people would not go out; they were very obstinate; the infection was raging, and I assisted to get them out. Sometimes I would go and have the dead bodies examined, if people objected to them being examined. Then I also helped in the disinfection of the houses, and valued the things which were destroyed.

12,521. Is corpse inspection hateful to the people?—Yes, although it is well-conducted; but because it is

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against the Muhammadan and Hindu religions to touch a corpse after death.

12,522. Were the private Plague Hospitals and the segregation camps attached to them popular with the people?—Yes.

12,523. What castes started them?—One private hospital was started by Seth Vishandas, one was started by the Sata community, another by the Memon community, and another by the Parsee community.

12,524. And the people did not object to sending their sick and contacts to them?—They did not object.

12,525. Now will you tell us your experience about the voluntary camps across the Lyari? Were they popular with the people?—Yes.

12,526. Were the people willing to leave the town if they were allowed to go into a voluntary camp?—Yes.

12,527. Is there any other subject of interest you have to tell us about?—The people had strong objections to going to the Municipal segregation camps started by Government. The people also had objections to the quarantine camps and segregation camps of the Government. They had a strong objection to the military being employed on plague duty, and they also objected to the Malir camp.

12,528. What did they object to in the Malir camp?—They objected because trade was affected a little here; they want these observation camps at the place of their destination.

(Witness withdrew.)

[Adjourned till to-morrow.]

At The Frere Hall, Karachi.

THIRTY-FIFTH DAY.

Thursday, 26th January, 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Mr. A. CUMINE.
Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Mr. H. F. Brayson.

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Mr. H. F. BRAYSON called and examined.

12,529. (*The President.*) You are Deputy Collector of Schwan?—I am; that includes the Kotri taluka.

12,530. (*Mr. Cumine.*) Would you first give us a description of Kotri, where it is, and what is the size of it?—Kotri is on the right bank of the Indus, situated about 105 miles from Karachi. The river is between it and Hyderabad, which is about three miles away from Kotri.

12,531. What is the population?—The population was 7,909, but I think it stands now at 7,000. There has been a falling off since the last census.

12,532. What is the date of the first imported case? Put aside for the present the plague-stricken passengers taken out of the trains. I will ask you about them afterwards. The imported cases I am now asking about are those that had managed to get into the town. What was the date of the first case that managed to get into the town?—It was on the 24th of January, 1897.

12,533. Could you give the date of the last that got into the town?—The 26th of March.

12,534. How did you deal with the imported cases that got into the town; did you remove the people?—I removed the cases to the plague camp, and the side houses and the occupants of the case house into another camp.

12,535. Did you disinfect the house?—I disinfected the house thoroughly with perchloride of mercury—1 in 1,000—and I used fire also.

12,536. Did you take up the floor?—I took up the floor three or four inches, and burned it.

12,537. How long did you keep the people in the segregation camp?—From 10 to 12 days; 12 days was the outside.

12,538. You then let them come back?—I then let them come back.

12,539. Was there any recrudescence in the house among the people when they came back?—No, there was none.

12,540. Now tell us when the first indigenous case was?—On the 26th of March, that was the first indigenous case.

12,541. Had there been any change in the weather about that time?—We had north winds prevailing, and we had damp; about 60 cents. of rain had fallen.

12,542. What was the first indigenous case, and where did it occur?—A woman named Hiji was the first case. We found this case on the 26th of March, when I had intimation of an imported case there. Hiji was next door. Seeing the place pretty thickly populated and the houses pretty close together, it occurred to me that we might look into these side houses. I knocked and got the people out after some trouble, and first of all the uncle of this girl, Hiji, staggered up and seemed an undoubted case, but he was treated as an imported case. Then, when we were removing the people I noticed Hiji's walk; she limped a little, and we examined her and she had fever, and, on examining her further, we found that she had a bubo.

12,543. She had not been out of Kotri?—She had not been out of Kotri.

12,544. What caste was Hiji, and in what part of the town was her house?—There were two parts of the town. I have a sketch here.* I may refer to the two parts as the eastern and the western parts, and there is the main road from Jerruck to Sehwan, which cuts through the town. She was in the western half of the town, in what is known as the Sadapura Quarter.

12,545. How did you treat her; did you remove her to the hospital?—Immediately.

12,546. And the contacts to the segregation camp, and disinfect them?—Yes.

12,547. Up to this time had you had house to house searchings?—Not for the purpose of cases. But, as a precautionary measure, I called upon the people to cleanse their houses and whitewash them.

12,548. But you had not had a house to house searching?—No, we had not had a house to house searching.

12,549. Did you now institute house to house searching?—I did not.

12,550. Could you give us the figures of attacks and deaths for the following weeks, until the epidemic ceased?—I can give you the local cases. I have got them separately. For the week ending 27th March, 1897, one case; for the week ending 2nd April, 1 case; for the week ending 9th April, no cases; for the week ending 16th April, 1 case; for the week ending 23rd April, 4 cases; for the week ending 30th April, 3 cases; for the wecking ending 7th May, 5 cases; for the week ending 14th May, 2 cases.

12,551. Did you at any time evacuate the town entirely?—Not entirely, but I did evacuate the Dhobi Quarter of the town at the first outbreak.

12,552. Which quarter is it?—The same side as Sadapura Quarter. I did that for the safety of the Europeans for whom the dhobis washed. I put them away on the river bank in touch with the town, but I kept them apart, and I used to go round so as to have them under my eye.

12,553. How many people did they consist of?—Between 70 and 75. I had not any register of them.

12,554. In this first outbreak was corpse inspection ever resorted to?—In every case.

12,555. When did you begin corpse inspection?—From the commencement, I believe, or say from early in January.

12,556. Now I will ask you to get for us and put in your evidence the total mortality for each of the months of January, February, and March, 1897, at Kotri; also the average moriality during the same months for five years?—I can get them. (The following are the figures supplied by the witness):—

Month.	Mortality.	Average of previous 5 Years.
January, 1897 - - -	23	15·8
February, Do. - -	17	11·6
March, Do. - - -	29	16·6

12,557. All throughout the first outbreak you dealt with the cases in the way you have described—moving the patients to the plague camp, and taking the contacts to segregation camp, and allowing them to return in 10 or 12 days?—I did.

12,558. After their houses had been disinfected with perchloride of mercury?—With perchloride of mercury, and the floors dug up.

12,559. Did you ever find a recrudescence in a disinfected house after the people had returned to it?—There was only one case. It was a case where a child was brought in with plague and the people were taken out into the camp. When I allowed them to come back, the husband and the wife took the disease; I believe three days afterwards. The history of the case was that the husband, immediately after having been discharged, went up to Hyderabad to revive his business connexions. He was a vegetable dealer, and, as I ascertained at the time, he got ill soon after coming back or the next day, and he was removed. When his case was reported, I found also that his wife had a bubo, and I took away the children from them—they had three children—I removed them to the segregation camp, and the eldest child, a boy about eight, within a week afterwards, showed symptoms of plague. He complained of a pain in the groin, which afterwards developed into a bubo.

12,560. Who superintended the disinfection of the houses?—I invariably did it myself.

12,561. When people were taken to the segregatiou camp, were their clothes disinfected before they were admitted?—Yes, at the camp; we had arrangements just at the entrance to the camp.

12,562. When people died of plague, what did you do with their clothes?—We burnt their clothes.

12,563. Have you any instances of clothing carrying infection?—I cannot state any positive instance.

12,564. What did you observe about rats? Did you find many dead rats?—I found in one shop three or four rats when I was clearing the shop out.

12,565. Had there been anybody ill in the shop before?—A boy had been turned out.

12,566. Had he been ill?—Yes, he had been ill.

12,567. So that plague in human beings had preceded plague in rats?—Yes.

12,568. Have you any instances where plague in rats preceded plague in human beings?—No, I have not.

12,569. Is there any sign that the epidemic decreased in virulence towards the end—that towards the end so many cases did not prove fatal?—I cannot say. I think there was no abatement of the virulence towards the end. It continued severe.

12,570. Can you tell us to what extent plague developed in the segregation camp—how many contacts got plague?—There were only two cases—one was the mother-in-law of the girl Hiji.

12,571. On what day after admission did she develop plague, can you tell us?—The 7th day, I think, this case was; she was an attendant; she was not in the segregation camp.

12,572. It is the segregation camp that I am asking about. Amongst the contacts that you took to the segregation camp, in how many cases did plague appear amongst them?—This was a contact out of the same house—this one I am speaking of.

12,573. It appeared in one case only?—In one case.

12,574. On what day after admission did it occur?—The 6th or 7th day after.

12,575. Did plague spread in the segregation camp at all from that one person who developed plague in it?—No.

12,576. You had a plague camp and a segregation camp. Had you any voluntary camp of the sort they had in Karachi?—No, we had not.

12,577. Were there any escapes from the segregation camp?—Not from the segregation camp, but there were two escapes from the hospital, or the plague camp, where the people were. There was one man who had had plague, but he was convalescent. The other was his attendant.

12,578. Can you tell us which the castes were that were principally affected in the first outbreak, and the parts of the town in which they lived?—All were Hindus except two, who were Muhammadans; they were Banniahs chiefly; one was a Brahman.

12,579. Please indicate the part of the town?—In the Sadapura Quarter.

12,580. What was the date of the last case of the first epidemic?—The 9th of May, 1897; a local case.

12,581. What was the date of the first recognised case of the second epidemic?—The 28th of October, 1897.

12,582. What was the date of the last case of the second epidemic?—The 29th of January 1898.

* *See* Appendix No. XLI. in this Volume.

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12,583. Now I will ask you to put in the mortality in Kotri for each of the months of May, June, July, August, September, and October. I should like it by castes, ages, and streets. And I should like to have a rough sketch of the town with the deaths marked in their order, in the places they occurred in?—I have here a statement showing the weekly deaths with the average deaths from April to January, as follows:—

Weekly Death-rate in Kotri.

	Total Deaths.	Average for Week.	Plague Deaths.
Week ending—			
2nd April, 1897	6	4	5
9th „	5	4	1
16th „	3	2	3
23rd „	10	2⅔	3
30th „	2	1⅔	1
7th May	3	1⅔	2
14th „	4	2	1
21st „	4	1⅔	0
28th „	2	2⅓	0
4th June	4	1⅓	0
11th „	1	1⅔	0
18th „	4	⅓	0
25th „	2	3⅔	0
2nd July	4	1⅔	0
9th „	1	1	0
16th „	1	2	0
23rd „	5	1	0
30th „	2	⅔	0
6th August	2	1⅓	0
13th „	2	2⅓	0
20th „	5	1⅔	0
27th „	2	1⅓	0
3rd September	4	1	0
10th „	4	2	0
17th „	2	1⅔	0
24th „	4	1⅔	0
1st October	3	2⅓	0
8th „	7	1	0
15th „	7	2	0
22nd „	8	1⅔	0
29th „	16	2⅔	1
5th November	20	1⅔	19
12th „	18	2⅔	7
19th „	18	2⅔	8
26th „	11	2⅔	8
3rd December	12	2⅓	9
10th „	8	1⅔	4
17th „	8	4	3
24th „	4	4⅔	1
31st „	6	3	2
7th January, 1898	6	3⅓	4
14th „	2	5⅔	0
21st „	6	3⅓	1
28th „	5	5	1

I attach a statement with the deaths entered in the order of occurrence. The streets and lanes in Kotri are not named, but I have entered the most likely names they would be known by. These are also given in the map of Kotri which I have put in.*

12,584. Had any of the deaths in September been suspicious?—In the end of September two brothers died within about three weeks of each other, and their mother died in the interval. An anonymous petition was made that they died from plague. Inquiry, however, elicited nothing to support this, and the men had all been seen by the Hospital Assistant, Mr. Metharam, a reliable man, while ill. The only point in support of it was that a relative had recently come from Bombay. But he has not been ill himself.

12,585. Please give us the details of as many deaths as you can that occurred in the interval between the two outbreaks?—I have a statement here of the deaths in September and October according to the occupations of the people—whether Hindus or Muhammadans.

12,586. Could not you put in that table?—Yes. In the column of remarks I have shown the relationship existing between different people.†

12,587. (*The President.*) Will you state which of these cases are likely to have been cases of plague?—These cases had been medically seen by the Hospital Assistant.

12,588. And he diagnosed something different from plague?—Yes.

12,589. Are there any cases which you think may have been plague?—Three deaths occurring in quick succession in the same house created a suspicion, not at the time, but subsequently, when plague was declared. There had been an anonymous letter sent with regard to these three sudden deaths that gave rise to a suspicion, but I personally inquired into the matter. On hearing of these deaths, I went down to Kotri and inquired on the spot of people who were likely to be able to tell me, and I did not ascertain that there were any symptoms of plague.

12,590. In your opinion, there is no ground to suspect them?—That is so.

12,591. (*Mr. Cumine.*) Please tell us whether you had corpse inspection during May to October?—We had.

12,592. What else was being done to protect Kotri against re-infection? Was plague prevailing anywhere else during the months of May to October?—In 1898, no.

12,593. When you discovered the second outbreak, had there been any change in the climate about that time?—We had had very heavy rain and a very high inundation.

12,594. In what month?—In July.

12,595. Were the first diagnosed cases of the second outbreak all in one place or were they dotted about all over the town?—They were scattered all over the eastern part of the town.

12,596. I think that a table exists that gives some particulars regarding the first 17 or 18 cases discovered in the second outbreak. Could you put that in?—Yes; it is as follows:—

* Appendices No. XLI. and XLI. (i.) in this Volume.

† Appendix No. XLI. (ii.) in this Volume.

No.	Estimated Duration of Illness before Discovery.	Date of Discovery.	History.	Possible Source of Infection.
1	14 hours	28th October	A Panjabi luggage clerk. Brother had returned from Multan 15 days previously. At work on 27th.	Unknown.
2	3 days	„ „	A Banniah, whose shop had, however, been closed for some time. Lived quite apart from all other cases.	„
3	7 „	29th „	Brothers. Went to a village in Hyderabad on 21st, returned on 23rd, when they had fever. One boy developed bubo on 25th.	„
4				
5	3 „	„ „	Female, aged 20. May have been ill some days	Lives near No. 1.
6	1 „	30th „ (evening)	Female, aged 22. Felt the premonitory chill on 29th	Lives near Nos. 3 and 4.
7	2 „	„ „	Male, aged 48. Lives in same house as above	„ „
8	1 „	„ „	Boy	Next door, and nephew of No. 5.
9	1 „	„ „	Brother of No. 8	„

No.	Estimated Duration of Illness before Discovery.	Date of Discovery.	History.	Possible Source of Infection.
10	2 days (?)	1st November	Boy, aged 8. Found dead in boat, to which he had been removed from house.	Lives not far from Nos. 3 and 4.
11	1 „	„	Brother of above. Died same night	„ „
12	1 „	„	Mother of above	„ „
13	1½ „ (?)	„	Found dying	Not known.
14	3 „	„	Shopkeeper, aged 30	„
15	3 „	„	Aged 3	Lives not far from Nos. 3 and 4.
16	11 „ (?)	„	A postman. Left Karachi on night of 18th. Spent one night in Kotri. Left it on 20th to go to a Pir. Returned on 25th with bubo.	Not known.
19	1 „	„	Girl, aged 10	Same house as No. 14.
20	1 „	„	Aged 7	Brother of Nos. 3 and 4.

12,597. Did the second outbreak appear to begin amongst the castes and in the portions of the town affected during the first outbreak, or did it appear to begin amongst the castes and in the places not affected in the first outbreak?—The Banniahs were affected in the second outbreak, but the first case we had was of a Hindustani, a railway employé, and then it went on amongst the Banniahs, and I think at the same time amongst the Muhammadans too: the first one was a Panjabi.

12,598. Then it is not observable that it stuck to the same castes and people, or, on the other hand, that it avoided the castes and people that it affected in the first outbreak. There was nothing observable of that sort?—There was nothing observable of that sort. It broke out in the eastern half of the town that had not been affected to any extent in the first outbreak.

12,599. Did you notice any dead rats in the second epidemic?—At a late stage of it, after the evacuation, and the houses were being cleared out. There were a few instances in which we had found skeletons of rats.

12,600. Did you completely evacuate the town at once?—Not all at once.

12,601. Did you try partial evacuation by quarters?—Partial evacuation, that is, the side houses; they were put away into segregation.

12,602. You did not try to evacuate a whole quarter at once?—We did not take quarters.

12,603. What was the first thing you did? To surround the town with a cordon?—That was done two or three days after the outbreak; previous to that we had watched the roads.

12,604. Did you make a list of the inhabitants?—The Hospital Assistants later made a list of the inhabitants for the purpose of examining them.

12,605. What was the strength of the cordon?—About 50 men.

12,606. Do you mean 50 men on duty at any one moment or 50 in all?—Thirty men on duty at once, at one moment.

12,607. Was there any European patrol?—Six soldiers of the Wiltshire regiment from Hyderabad, with a corporal, used to come across from Hyderabad every evening and patrol the cordon at night.

12,608. Could you tell us what the number of people enclosed by the cordon was?—2,600 in the camps and town.

12,609. Where were the balance of the population?—In the railway quarters.

12,610. How many?—1,500 removed there, and in the Baluch village in the north of the town I should say there were approximately five to six hundred people. The railway employés who had their fixed abode in the railway limits outside the cordon were about 2,000, that is including Europeans and the station staff and the loco. department. There are some smaller villages also on the west and north-west of the town.

12,611. What would be the population of those?—I should say between 300 and 400 people.

12,612. Had any large proportion of the population run away before the cordon was put round?—I do not believe so.

12,613. What men was the cordon composed of?—We started with a town police of 36, including one Chief Constable, four head constables, four mounted constables, and 27 foot constables. Immediately afterwards we called in 19 constables from the district police. About the same time we had 25 Baluchis from Hyderabad. 15 of them were, however, taken away in the first week, and we had 10 men with one native officer remaining. We had 25 police from Hyderabad, and 10 each from Jacobabad and Shikarpur respectively. I am not quite sure about these two numbers, there may have been one or two more or less. We had also 20 extra police sanctioned. That made a total of 131. The men actually on cordon duty were 55.

12,614. At any one moment?—Always on—on sentry duty; that is to say, 30 men with five of their corporals or sergeants to watch them and so on. Then we had 22 policemen at the different camps and we had 12 for town duty, that is to look after the evacuated houses and so forth and we had about 41 for reliefs. These figures also I give approximately because there is no record of them. I simply judged from what I used to see.

12,615. What was the distance between the individual sentries on the cordon?—They varied according to the view commanded by the different positions, and according to the barriers; for instance, at the river side they were from 300 to 350 yards apart.

12,616. Will you put in this sketch showing the position of the sentries round the cordon?—I put in the plan, which shows the position of the sentries.*

12,617. The cordon enclosed the town and the camps too?—The cordon enclosed the town and camps too.

12,618. Could you tell us what the circumference cordoned was?—I have not calculated the circumference but I could give you the area of the whole in acres. The western part of it was 149 acres, and the eastern portion 64 acres.

12,619. That is of the town proper inside the cordon and the parts where the camps were?—Yes, inside the cordon: and the part where the camps were is included in that. At the river side we had 300 to 350 yards, but on the west side, the land side, we had 100 to 150 or 200 yards apart. They all more or less stood on high ground on the bund known as the Protective Bund. That is on the south side and the west side and on the north side there was the Ramp, the Indus bridge, which also commanded a very fine view. At night the cordon was drawn in closer by excluding certain bungalows, the servants of which need not have come into the bazars and so forth—railway bungalows. That left 10 men available on the north side and two on the south side who were out in the day to watch the Jerruck Road.

* *See* Appendix No. XLII. in this Volume.

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12,620. Was all communication between the cordoned part and the outside world completely stopped?—No, not completely stopped; there was a check—we had a system of passes. The people in the railway quarter used to come into the town for their supplies. We generally had passes issued to the known people, and they were admitted for business, and they used to pass out again. We also had to admit villagers with supplies on general passes. They would come in with milk, fuel, grass and butter and so on. Kotri had no local supply.

12,621. Had you any cases where people escaped whom you did not wish to be allowed to go outside?—There were two individuals.

12,622. Supposing people had escaped and passed the cordon and run away, how would you have known of it?—They could not have got away without passes by railway.

12,623. But supposing they had succeeded in getting clear away, how would you have known it?—The cordon did not include the station. They would have had to get outside the cordon to get to the station. They could not have taken the train from there. They could not have gone by ferry, because the ferries three miles above and three miles below—that is, at Railo and Karakhao had been absolutely stopped. The launch used not to run at nights, and they could not have gone across to Hyderabad without passes.

12,624. Could they not have gone through the desert to some small station either north or south of Kotri and get into the railway there?—I do not think they could have done that.

12,625. But supposing they had succeeded in doing so, how would you have known that they had run away?—They would not have got tickets.

12,626. But the question is how you would have known that they had gone?—We had our registers to check the population.

12,627. Was the population in the town compared with the registers every day?—Every day.

12,628. The whole 2,500 people every day?—Yes, the whole of them every day. This was done for the purpose of watching sickness by taking the temperature of the people, and seeing that the people in the camps were keeping well, and also as the camps were being relieved and people were going into the town, the same system was adopted there to keep a sort of check as to their state of health.

12,629. If the people were going daily into the town, how did the Hospitals Assistants manage to get hold of them to feel their pulses and see that they were well?—They commenced very early in the morning, and the people were prohibited from leaving the camp until they were examined.

12,630. How many Hospital Asistants had you to o this examination work?—Five.

12,631. People bringing supplies and so forth were allowed to come inside the cordon, were they not?—They were, on general passes.

12,632. Would it not have been possible for some of the townspeople to have gone out with those passes and left the real pass owner inside?—No, I do not think that was possible. They were known people who used to come in regularly, every day, and if a stranger attempted to get out he would be recognised. Sometimes mistakes did happen in the way of servants of the railway who would have probably wrong passes, but they were always stopped.

12,633. Two people did succeed in getting away, I think you said. Was it from the examining Hospital Assistants in the camps that you first heard of the absence of these two men?—This was at a very early stage. They got out before this temperature system was adopted.

12,634. When was this temperature system adopted?—About the middle of November.

12,635. For people who wanted to get away, and whom you were willing to allow to go away, was there a special departure camp?—Yes, there was a special departure camp for them.

12,636. For how long did they remain in that?—For 10 days.

12,637. Up to what date were the great mass of the people detained in huts?—By the end of December every house in the town had been disinfected, both by lime-washing and disinfectants. A few cases occurred, however, during the next month, and in the last week there were four cases. Three of these were connected together, and were believed to have a common origin in a grain shop. The fourth was a doubtful case. In consequence of these cases, however, the great mass of the people were detained in the huts till February had begun. The cordon was maintained till the end of February, and the railway employés were then permitted to return.

12,638. In all how many cases of plague were there?—In all there were 100 cases of plague in the outbreak, of which 68 terminated fatally; 16 of these died before admission to hospital, and 3 others after admission, but before any treatment could be given them. Out of 81 cases treated, therefore, 32 were cured, or a percentage recovery of 39·5.

12,639. Out of the hundred cases, how many were Hindus and how many Muhammadans?—77 Hindus; 23 Muhammadans.

12,640. Which caste did the Hindus belong particularly to?—The Banniah caste.

12,641. Out of the 77 Hindus, how many died?—51.

12,642. Out of the Muhammadans?—17.

12,643. Will you tell us how many cases occurred in the various camps?—The following number of cases occurred in the various camps:—

Plague camp (attendants on sick)	2
Isolation camp (relatives of sick)	8
Segregation camp (neighbours of sick)	7
Health camp	14
	31

12,644. As regards the cases that developed in the isolation and segregation camps, did they occur shortly after arrival in camp?—They did with three exceptions. The three exceptions consisted of two who were found to be suffering from plague symptoms when they had just completed 10 days' detention, and, in the third instance, of a man who went over from the isolation camp at night to visit his daughter who was in the Plague Hospital, and thus caught the disease.

12,645. Of the 14 cases in the health camp, how many caught the disease within 10 days of arrival in the camp?—Seven. The other seven developed after longer periods of detention in the camp, but were no doubt due to the communication which, as above stated, was permitted in the town.

12,646. Among the people allowed to return to the town after segregation, how many cases occurred?—There were four cases. In one of these, the person had returned to the originally infected house after 11 days' segregation; in another, he had returned to another house, but is believed to have obtained access to the old one; while in two others, the patients were originally neighbours of infected houses, and were allowed to return to their houses after segregation. The houses in each of these cases had been disinfected, and though it is of course possible that there were mistakes in the disinfection, yet it is more likely—and has been our experience elsewhere—that the germs of the disease do manage to hold on, and that it is not safe to allow return after so short a period as 10 or 12 days. In the last two cases, the epidemic also occurred among persons allowed to return to the town; but one case was traceable to another source of infection, while the other was doubtful, and in the house of neither had there been previous cases.

12,647. Amongst the disinfecting parties, how many casualties were there?—Five, I believe.

12,648. Can you give us any instance of the special value of disinfecting every house in the town, whether a plague case had occurred in it or not?—There was

one instance only where the house escaped disinfection, or was overlooked, in which a Fakir woman took the disease and died from it.

12,649. Could you give us a table showing the plague attacks and deaths by age and sex?—Yes, the table is as follows:—

Attacks according to Age and Sex.

Religions.	Attacks.		Died.		Cured.	
	M.	F.	M.	F.	M.	F.
Hindus - -	51	26	33	18	18	8
Muhammadans -	14	9	10	7	4	2
	65	35	43	25	22	10

Age.	Attacks	Died.	Cured.
Within 5 years - -	4	0	4
Between 5 and 10 years -	14	10	4
„ 10 „ 15 „ - -	15	10	5
„ 15 „ 20 „ - -	20	10	10
„ 20 „ 25 „ - -	8	5	3
„ 25 „ 30 „ - -	11	10	1
„ 30 „ 35 „ - -	5	4	1
„ 35 „ 40 „ - -	8	7	1
„ 40 „ 45 „ - -	2	2	0
„ 45 „ 50 „ - -	6	3	3
„ 50 „ 55 „ - -	4	4	0
Over 55 years - - -	3	3	0
	100	68	32

12,650. How did the infection appear to you to be spread in the town? By friends visiting sick people? Or did it go to neighbours first, or how?—It seemed to me that it went from contact with the people, not from mere houses.

12,651. Was the town completely evacuated?—There were some very poor people who were allowed to stay in the western half of the town.

12,652. And with that exception the town was practically emptied?—Yes, practically emptied.

12,653. On what date?—It commenced on the 26th of November, and they were out by the 4th of December.

12,654. Have you any figures to show the beneficial results of emptying the town?—The beneficial results which follow—as they always do—the moving out of people into camp may be judged from the following weekly totals of cases:—

Week ending	30th October, 1897 -	5
„	6th November -	31
„	13th „ - -	4
„	20th „ - -	10
„	27th „ - -	15
„	4th December - -	16
„	11th „ - -	4
„	18th „ - -	3
„	25th „ - -	3
„	1st January, 1898 -	2
„	8th „ - -	2
„	15th „ - -	0
„	22nd „ - -	1
„	29th „ - -	4
		100

Thus, the number of cases, which had been steadily increasing, dropped at once after the complete emptying of the town.

12,655. In the second epidemic besides the plague camp and the segregation camp, had you health camps for the people?—There was a health camp; it was started by Seth Vishandas.

12,656. Was there more than one? Was there one for Muhammadans from the infected portion?—There was a distinction made between the Muhammadans and Hindus. They were all in the same locality just across the road.

12,657. Before people were admitted into health camps were they effectually disinfected?—Yes, they were all disinfected.

12,658. Were they allowed to take any plague-stricken people into the health camps with them?—No, they were taken away to the Plague Hospital.

12,659. Did you find that plague spread from one person in a health camp to another person in a health camp?—No, I do not think so.

12,660. Were the people in Seth Vishandas' and the Musalmans' health camps allowed to go into the town whenever they chose for their work?—Yes, they were allowed to go into the town whenever they chose after examination.

12,661. Were all the houses in the town disinfected before the people were allowed to return at the end of the second epidemic?—Every one.

12,662. With perchloride?—Perchloride, yes.

12,663. Under whose supervision?—Under the supervision of Mr. Davies, who was especially sent there, and Lieutenant Roche of the Wiltshires, with the assistance of some soldiers of the Wiltshire regiment.

12,664. Now, about the examination of passengers on the railway. When did that begin at Kotri?—On the 4th of January 1897.

12,665. At any time was there detention for 10 days of all passengers from infected areas whether they had a high temperature or not?—No, not at Kotri.

12,666. During the time the examination went on, how many people were taken out of the train in consequence of a high temperature and subsequently developed plague?—I should say 16 or 17.

12,667. In how many months?—From the 1st of January to the 15th of May 1897.

12,668. Was there at that time an examination at Karachi of outgoing passengers?—Yes.

12,669. Was there during that period any detention for 10 days at Karachi of outgoing passengers?—There was no detention as far as I know. They were simply examined and passed on. I am not quite sure about the males' camp, which was formed at a later period, because there were about eight cases that passed through after examination at Karachi, that had developed plague within 10 hours, to say nothing of cases that had developed plague in other parts of the line in my charge. They had a detention camp at Dadu also.

12,670. Where is Dadu?—It is on the railway line to the north of Kotri.

12,671. Where does that line lead to?—To Sukkur; it is about 110 miles away from Kotri.

12,672. Was this camp under your revenue charge?—There was a Medical Officer in charge of it, Dr. Gwyther. It was in my revenue charge. 27 cases were taken out of trains at Dadu.

12,673. Do you mean they had plague on them when they were taken out of the trains, or did they develop plague whilst they were being detained for 10 days?—The majority of them, I believe, developed plague.

12,674. Was it only passengers from the Karachi side that were examined and detained either at Kotri or at Dadu?—At a late stage—I think about April—when Sukkur was badly infected, the trains from Sukkur used to be examined also.

12,675. Now, to leave Kotri, could you give us any cases of villages organising of their own accord a system of self-protection against plague?—There is the case of Manjhand; that is the next town of importance up the line to Kotri.

12,676. What did they do?—They had camps there, and any person arriving by train who was suspicious

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was kept under observation for a short time. None of the detentions proved to be plague. There was only one imported case very close to Manjhand, but that had been carried across from Hyderabad.

12,677. Which, if any, were the plague measures in which the people co-operated with the Government authorities?—In Kotri I found them very ready to do anything that was wanted in the first instance, and in the second instance they were equally so. I found them very ready to co-operate. They seemed to have a dread of having the military introduced, and that in a manner influenced them I think.

12,678. (*The President.*) There is one point I should like to ask you about. Why was the railway quarter not included in the cordon?—Because it was not infected.

12,679. But a great deal of infection seems to have been carried everywhere into the surrounding district by the railway?—These men had camps provided for them by the railway, and they were under the observation of their superior officers.

12,680. Were they prevented from travelling into the surrounding country?—They could not get away anywhere without a pass; they could not get out of Kotri without a pass. They could get into the Kotri town proper with the assistance of a pass.

12,681. Are you aware of any cases having originated in Kotri because of the inefficiency of the cordon in the railway quarters?—No, there was nothing of that sort happened. There is one thing in connexion with the examination of corpses which I spoke about that I should like to add. There was no examination of corpses from about the end of May until the death-rate ran high, early in September. I said that all corpses were examined, but when the disease died out they were reported and passes had to be obtained for burials, but corpses were not examined.

12,682. (*Mr. Cumine.*) But they were seen by medical men, were not they?—Not until the death-rate began to run high there again.

12,683. Do you know whether corpse inspection at Kotri was discontinued after the close of the first epidemic?—Yes, it was.

12,684. Do you know that for certain?—To the very best of my recollection I do.

12,685. When was it revived?—After the deaths of two boys in September, and the mother within three weeks.

12,686. It continued after that?—Yes, it continued right through the second epidemic.

12,687. (*Dr. Ruffer.*) You told us that you only had one death among children under five years of age; was that from plague?—No deaths, four cases.

12,688. How was the cause of death in the children ascertained; did you have corpse inspection of the children? We have been told in another place that they simply took the friends' word for it. Did you have corpse inspection of those children?—In Kotri the corpses were examined.

(Witness withdrew.)

Assist.-Surg. G. C. McMullen.

Assistant-Surgeon G. C. McMULLEN called and examined.

12,689. (*The President.*) You are the Assistant Surgeon in charge of the North Western Railway Hospital of Kotri?—Yes.

12,690. What are your medical qualifications?—I have a diploma from the Grant Medical College of Bombay, entitling me to practice in medicine, surgery, and midwifery.

12,691. (*Mr. Hewett.*) You assisted the civil authorities in this outbreak at Kotri?—Yes.

12,692. What was the death rate between the date on which the last case of the first outbreak occurred and that on which the first case in the second outbreak was discovered?—The average death rate was about two or three a week.

12,693. What was the aggregate number of deaths from the 14th of May, 1897, when the last case in the first epidemic occurred, to the 28th of October, when the first case of the second epidemic was discovered, and what is the average number of deaths for the same period?—80 and 37.

12,694. The death rate was twice as great in 1897?—Yes.

12,695. Were there any conditions favouring an outbreak of epidemic disease in the autumn of 1897 in Kotri?—We had a very heavy rainfall in July and August. We had a very high inundation that year of the river Indus, and the river rose much above the average, and lasted longer before it commenced to fall.

12,696. Those are the reasons?—Those were two reasons.

12,697. Have you any more?—At that time of the year sickness is always on the increase.

12,698. Was it more on the increase in 1897 than usual?—Those are the two reasons I attributed that to.

12,699. Were you on the look out for plague during those months?—In September I was.

12,700. You were not examining bodies till September?—Late in September I examined bodies; I had not examined them up to or before that.

12,701. Had there been any deaths in the town which appeared somewhat mysterious?—There were two deaths reported as being mysterious in the town.

12,702. In what month was that?—I believe that was in August.

12,703. You did not see the bodies?—I did not see them. I had nothing to do with the town of Kotri. I am only on the railway premises.

12,704. But you were helping the Civil Authorities?—I did not help them until long afterwards—till the end of September.

12,705. You saw the first cases of plague that occurred there, did you not?—I did.

12,706. Please tell us about them?—One was a Panjabi, and the other was the case of a Hindu—a Banniah.

12,707. They were both residents of Kotri?—Both residents of Kotri.

12,708. Had either of them been away from Kotri recently?—Neither of them had been away.

12,709. Were they cases of pneumonic or bubonic plague?—Bubonic plague.

12,710. You seem to think that the outbreak was of local origin: what do you mean by that?—That it was not imported.

12,711. But if plague did not exist in Kotri at the time, how do you think it broke out there?—In some mysterious way. I feel inclined to think that it was due to one of two or three causes; one was that the cleansing operations of the town took place just about that time on account of the Diwali and Dasehra, and then the advent of the cold weather—people bringing out their clothing, and preparing their winter clothing.

12,712. How would these conditions start plague?—In the case of the clothing, it had been put away, and it was being brought out just about that time, and they were examining the clothing prepared for the cold weather.

12,713. Do you think that the possibility of infection from outside can be absolutely excluded?—It was not traced.

12,714. Was any place infected in the neighbourhood of Kotri?—No; we had been practically free for months before—in fact the whole of Sind was declared free.

12,715. Have you a record of the total number of cases and deaths that occurred at Kotri?—No.

12,716. Did you notice any particular immunity among any class in the second outbreak?—I thought Muhammadans had more immunity than any others.

12,717. Did you notice any immunity in people of a certain age?—I did not.

12,718. Were the young children much attacked?—Infants were particularly free — infants were not attacked.

12,719. What do you mean by infants?—Children under two years old.

12,720. Do you know whether there were more bubonic or pneumonic cases?—Mainly bubonic.

12,721. Did you see any cases of pneumonic plague?—Two or three.

12,722. Did you notice any dead rats during the second epidemic at Kotri?—No, I did not; I attended to the the cases only for a few days, when I was relieved by Dr. Cameron.

12,723. You did not see much of the outbreak then?—I did not see much of it. It was only for the first few days.

12,724. Have you any theories as to the dissemination of the disease?—I believe old clothing is a great means of disseminating disease.

12,725. Did any case come to your notice in which contagion must have been disseminated by clothing without any possibility of human contact?—Excepting when the two first cases occurred; that was the only time I should have said that it was possible that clothing itself was responsible for it.

12,726. In those first two cases, were you able to find anything about the clothing that could have infected those two persons?—Yes, there was some old clothing there.

12,727. Did you know that that clothing had been used by people who had had plague?—No; I would not say for certain that it had been used, or had even been in contact with plague cases.

12,728. (*Dr. Ruffer.*) Do you know whether your cases of plague pneumonia got the plague from another case of plague pneumonia, or from an ordinary case of plague?—It was from an ordinary case of plague. They were in contact with cases of bubonic plague.

12,729. Did you see any cases of bubonic plague which you could clearly trace to a case of pneumonic plague?—No.

12,730. Could you trace any pneumonic cases to another pneumonia case?—No.

12,731. I did not understand what you meant about the cause of the second epidemic. Did you say the outbreak may have been due to clothes?—Clothing that had been in contact with cases in the first outbreak and had been put away. Before a case would be reported to us, generally the clothing was all made away with. The natives came to know that we would destroy clothing, and especially old clothing.

12,732. You did not mean to imply that the plague can originate spontaneously?—No.

12,733. Do you think that the plague may have remained dormant, or that there may have been hidden cases of plague in the interval between the first and second epidemic?—I do not think so, because we had free intercourse with all the people. The people were constantly coming and going, and our people were constantly going to Hyderabad and the surrounding villages. They were not excluded from going anywhere. We had free intercourse with every place round, and Kotri was the only place infected.

12,734. Was there any corpse inspection at that time?—When we declared plague, there was.

12,735. Between the first and second epidemic?—The corpses used to be inspected by the Municipal authorities. The Hospital Assistant was in the town.

12,736. Have you any experience of inoculation in the first epidemic?—No, none at all.

(Witness withdrew.)

Mr. J. SLADEN, I.C.S., called and examined.

12,737. (*The President.*) You are Acting Collector of Karachi?—Yes.

12,738. And President of the Plague Committee?—Yes.

12,739. (*Mr. Hewett.*) When did you become President of the Plague Committee?—About the 19th of August, 1898.

12,740. Has there been any change of policy since you took charge of the Plague Committee?—A change of policy was announced after I took charge, but a gradual change had been coming on throughout the second epidemic.

12,741. Mr. Giles has described to us what was done originally under the Plague Committee during the second epidemic; could you tell us what the changes are which have taken place since you became Chairman?—Soon after I took charge Mr. Giles asked the Plague Committee to consider what steps they should take in view of a further epidemic occurring, and on this we passed a resolution in September which practically announced that if cases occurred in Karachi—if there was an epidemic—we should allow the people to go out into voluntary camps across the Lyari into a certain area, which we pointed out, where they would not be interfered with in any way; they could take their sick with them, and they would not be interfered with. I can show you the resolution if you care to see it.

12,742. This took place in September?—The resolution was passed in September.

12,743. But the people had been going into voluntary camps long before that?—The main body went into voluntary camps in May. I was not in Karachi myself, but I heard that they went about May, and remained until the end of the epidemic.

12,744. So that there was no actual change of policy in this respect after your assumption of office?—I believe that when they went into the voluntary camps originally it was not actually in accordance with orders. The announcement in September practically legalised it for the future.

12,745. When the people go into the voluntary camps, is any action taken to secure that all who leave the evacuated area actually go into the voluntary camp?—It is the business of the Plague Superintendent to see that the area which he considers should be evacuated is evacuated. If he has any doubt about the area, the Civil Surgeon is appealed to.

12,746. Does the Superintendent make a list of the people who occupy that area?—As a matter of fact that is done.

12,747. What happens to that list?—We have had very little plague since then.

12,748. I mean, what would be done in the future?—We could not keep a roll-call of everybody who went out, if an epidemic broke out in any serious form, at least I should not think so. We should take lists as far as we could where it is occurring to a small extent. When you get thousands of people going out in the course of a week, it would be impossible to make lists of everybody going out.

12,749. Then in the case of a severe outbreak of plague here, should it become necessary to evacuate a large area, the people would be turned out of their houses, and no particular attempt would be made to see that they all went into camp?—No attempt would be made to actually compare the names of the persons who left certain houses with the names of the people out in the voluntary camps.

12,750. Would there be any security that you had got the whole of the people who had left the evacuated area in the voluntary camp?—No, I do not think there would be absolute security.

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12,751. Supposing that you got them all into a voluntary camp, would there be any security that they would stay there?—No. There would only be this, that we should probably have other measures to prevent their going away from the desert area round Karachi.

12,752. Would you also endeavour to prevent them from going back into the city?—Yes, prevent them living in the city.

12,753. But not from going there for their ordinary daily vocations?—We said that we would not prevent them going for their daily work.

12,754. What then you would aim at, would be to get the people to leave the infected site, and remain out in the open?—Yes.

12,755. You think that experience here shows that this measure is effective?—Yes, I believe that the evacuation last year was very successful indeed. I know of similar instances where evacuation has been beneficial, and where it has absolutely stopped infection.

12,756. When you evacuate part of the town, and let the occupants go into voluntary camps, do you disinfect all the houses in the evacuated area?—No, we should not do so.

12,757. Why not?—Because, in the first place, it is a very considerable measure indeed to disinfect scientifically a large area; and, as far as I know, it has not been shown to be necessary.

12,758. The people would be removed from this area, because there was plague in it?—Yes, because there is plague; we do not know where the plague has extended to in that area.

12,759. It would be absolutely necessary, would it not, to disinfect the plague-infected houses?—That we do.

12,760. But if you did not know how far the plague had extended, how could you be certain that you had done that?—We disinfect the houses in which plague has actually occurred.

12,761. Might there not be other houses in which it had occurred without your knowing of it?—It is possible.

12,762. Does not that make it necessary to disinfect all the houses in an infected area?—We should have to disinfect every house to make the system perfect.

12,763. For how long a period after evacuation do you think it necessary to prevent people from going back to the town from these voluntary camps?—I cannot myself give any opinion worth much; but we have been adopting a period of about two months. That period has now come to be considered a safe time to keep them out.

12,764. You think that by that time it is likely that the infection will have stopped?—Yes.

12,765. To what do you attribute the stoppage of the infection after that period?—Solely to the fact that nobody is living in the houses.

12,766. Have you noticed anything which tends to show that the infection moves from house to house after a quarter is evacuated?—I cannot say I have noticed anything in that way. I have known instances where, after a quarter has been evacuated, a case has occurred in the next quarter, quite close to.

12,767. You do know of cases when this has occurred?—Yes; but I cannot say it is simply infection moving, or whether infection has been conveyed by persons.

12,768. You cannot exclude the possibility of men having conveyed it?—No. Our system of allowing persons to go into infected areas by day to work prevents us from excluding anybody from that area.

12,769. What have you done as regards the Memons whose houses have recently been evacuated?—There are several different bodies of Memons in the town. There is one settlement in the Sadr Bazar. They were the first to be infected—in September 1898 or the end of August. They took infection in the Sadr Bazar from rats, as far as we know. They passed it on to the Memons in the Rambagh Quarter, as far as we could see, through the agency of a little girl who went from there to the Sadr Bazar to attend some caste feast. When the first case occurred in the Rambagh Quarter, I think about six houses in the block were evacuated close by. Then a few days afterwards another case occurred in a house close to the one evacuated. We turned out the whole of that block; and a few days after that, again, a house on the opposite site of the street became infected; and we turned out the whole of that block. Both sides of the street were evacuated, and the plague stopped there. But somehow or other, before that, it had spread from there to a place about half-a-mile away on the Lawrence Road to some more Memons. We do not know how it got from one to the other. There we have been successful in evactuating the compounds of Memons and other people living close to them; until, I think, everyone in the neighbourhood has gone out. They are in the Nassarpuri Camp, and we have not had a case near there from outside the evacuated area for about ten days.

12,770. Now that they are in the Nassarpuri Camp, are they in a voluntary camp, or in a segregration camp?—They were supposed to go into a voluntary camp in the trans-Lyari area. The Nassarpuri Camp is on the city side of that area. When we turned out some people in August we turned out a large area in the Runchor lines. They were very poor, and we allowed them to go into one of these empty Municipal camps instead of building places for themselves; but before they had gone back we had to turn out these Memons in the Rambagh Quarter. They were allowed to go into another part—into the Nassarpuri Camp. And so on. Gradually, instead of allowing these people to go into the voluntary camp of their own accord, we have allowed them to remain in the Nassarpuri Camp.

12,771. Do the same rules apply to them in the Nassarpuri Camp as in the voluntary camp?—Very nearly. There is more supervision than in a voluntary camp.

12,772. Do you have a roll-call?—There is a roll-call.

12,773. Supposing people whose names are called out are not present, what happens?—No instance of that has been brought to my notice. There must have been cases, I know, when they were not present; but it has never been reported to me.

12,774. What would you do if they were?—It is rather difficult to say. Probably, if we found it occurred often, we should have to start a compulsory segregation camp.

12,775. Might it not possibly mean, should it be found that people were absent from the Nassarpuri Camp, that they would be coming back to reside in infected areas?—They cannot get back to reside in infected areas. The Superintendent of the quarter is constantly there—in fact, he is there every day.

12,776. He would detect them?—Yes, he would detect them at once. There was one case of a man who had a shop who did go back. He slept there, and he got plague and died. On inquiries, we found out that he had been secretly going back to sleep in his shop. We put the infection down to that.

12,777. Is corpse inspection carried out now by the Plague Committee?—Yes, but it is not the corpse inspection they had at the beginning of the second epidemic. Modified corpse inspection is carried out still.

12,778. In what manner?—In this way. We do not insist on seeing the bodies of children under two years old before they are taken away. When one of the Plague Volunteers certifies that to the best of his belief the child has not died of plague, that certificate is accepted. In the case of persons who have been attended before death by any qualified practitioner in the town, we accept the medical practitioner's certificate that those persons have not died of plague. In the case of a certificate not being presented, the Government medical officer sees the body, and very often the Superintendent of the quarter as well.

12,779. Has corpse inspection in your opinion always been successful?—As a measure I think it is very useful, but as a means of finding out every case of plague, it is not.

12,780. Have you had any instance in which a corpse has been examined and the fact that plague was the cause of death has escaped detection?—I have had about six cases recently.

12,781. Could you detail them?—There is a compound which was turned out on the Lawrence Road, in an area called Bhimpura. There had been five deaths in about three weeks in the first compound that was turned out,

before we knew of plague being there. There were five deaths in quite a short time, on the 2nd November last year, the 3rd, 4th, 6th, and 7th. All the bodies were seen by medical officers and were returned as not due to plague.

12,782. What medical officers were they seen by?—One was seen by a private medical practitioner in the town who had also been attending the patient.

12,783. European or Native?—A Goanese, Dr. De Souza. Two were seen by a Government Hospital Assistant, who has a great deal of experience of plague; and one was seen by a lady physician.

12,784. A European?—Yes.

12,785. Have you any other instance?—Again, in another compound, there were recently either two or three deaths. On the 4th of January 1899 there was a case which was certified as pneumonia; as far as could be seen, there was no connexion with plague. There was a second case in the same house on the 7th, and the patient was certified to have died from bronchitis.

12,786. Who certified these two cases?—Both were certified by private doctors who had attended the persons in life. One was by a retired Government medical officer (I am not sure what his qualifications were) and the other was by the same doctor as in the other instances I have given, Dr. De Souza.

12,787. How was it ascertained that these were cases of plague?—They were not ascertained to have been plague cases; but immediately afterwards an actual plague case did occur in which the infection could be very probably traced to this source.

12,788. Have you any other case?—I do not think I have any others.

12,789. It was stated the other day that there was no disinfection. Is it the case that every house known to be plague-infected is disinfected in some way?—Yes, thoroughly—more thoroughly, even, than before. I have seen a great many houses disinfected myself.

12,790. (*Dr. Ruffer.*) Do I understand that you accept certificates of Volunteers and Municipal Commissioners for children under two years of age?—It was for this reason: so very few cases of plague had been known to occur among children of under two years of age that we thought it was safe to do so. It is the practice among both Hindus and Muhammadans in Karachi to remove the body of a dead child as quickly as possible; no one may eat or drink until it has been taken away.

12,791. Why do you adopt two months as the length of time during which a house must be evacuated?—I think the practice has arisen from the fact that everyone was out for at least two months during the last epidemic, and that no case occurred after they had come back and been allowed to re-occupy their houses in Karachi.

12,792. You have no other reason?—There is no very special reason. Two months is not always insisted upon.

12,793. Do you know now of any other person going to live in an infected house without the knowledge of the authorities, or is the man who died the only one?—Do you mean contracted plague?

12,794. Whether he contracted plague or not does not matter. I take it that you only found out this case because he died of plague?—That was supposed to be the reason why he became infected.

12,795. But may several other persons have done the same?—I was told that the man went back to his house and slept there, and was supposed to have got infected in that way—in one of these infected compounds.

12,796. Supposing this man had gone back and had not died of plague, would you have discovered he had done so?—We should have found it out. There is a roll-call. There are always people about; we get information in various ways.

12,797. Do you think people in the camp substitute one person for another?—I do not think so.

12,798. Do you think such a thing is possible?—It is possible, because we do not know every individual by sight.

12,799. (*The President.*) Has plague ceased in Karachi?—I am sorry to say it has not.

12,800. Have you recently had a long interval without a case?—There was a case last Saturday; that was the last case.

12,801. Previously to that, how long was the interval without a case?—There was a case on the 18th, on the 19th, and on the 20th.

12,802. You have never been absolutely free?—We have never been absolutely free since the last epidemic. We have had an interval of 10 days without a case.

12,803. When was that?—I think it was in December—either November or December.

12,804. This last case was carefully investigated?—The last case was in the Nassarpuri camp.

12,805. How do you think the man became infected?—I cannot say. Dr. Ruffer has seen the case. I understand the infection seems to have been taken through the mouth.

12,806. From what locality or from what source was the infection obtained?—I could not tell you. He was turned out of his house about the 15th November. He had been out in the Nassarpuri camp to work every day.

12,807. Has that house been disinfected?—I do not know his house, but I think not. It was not a house in which a case had occurred before that I know of.

12,808. It is not a house which falls under your rule of disinfection?—No.

12,809. This man, as far as you know, contracted his illness by going back into one of these houses which had not been disinfected?—That is so.

12,810. It occurred in a plague-infected area?—Yes

12,811. Do you know of any other cases of a similar description?—No.

12,812. In the case of a prolonged epidemic occurring, has the question of disinfecting the whole of the houses in an affected area been considered by the local authority?—We considered it the other day. We thought of thoroughly disinfecting the whole compound where the Memons were, so as to allow them to go back again a short time afterwards. There are no more cases occurring.

12,813. Since the epidemic has practically disappeared there have been cases occurring every now and then in Karachi?—Yes.

12,814. And you have an infected area in which there remains a large number of houses which have not been disinfected?—Which have not been re-disinfected. During the summer, I believe, every house in Karachi was disinfected scientifically.

12,815. What month?—Between the months of May and July. I read it.

12,816. At any rate, you are considering the question?—Yes. There are one or two points I should like to mention. I believe some question was raised with regard to our treatment of the recent cases in the Market Quarter. I think you, sir, saw them in going round yesterday. They were in the Market Quarter, in the centre of the town. There were two cases there recently. Some question was raised as to why we did not disinfect the whole block, and had not taken stronger measures. Our object at present is not to be more harsh than we can possibly help, especially in the early stages of plague; because we find that at present we get information given us readily. If we keep our promise of not interfering with the people more than is absolutely necessary, they go out into the voluntary camps, and we get information of cases. We also find that it does not lead to further infection, as far as we can see. The first Market Quarter case was 13 days ago, and no case has followed that.

12,817. Will you state the facts of the case?—A woman died in a house in which there had been plague last May. The house was disinfected by the Superintendent. It was again disinfected and cleaned by the Medical Officer shortly afterwards; and there had been no plague in it for six months until this woman died the other day. She was certified as having died of plague. It was a case of premature confinement.

12,818. Was it a case of premature confinement or of plague?—Premature confinement, supposed to be due to plague. A bubo was found. In this case we have taken the people out of the whole block. Everyone in the block was allowed to go away. We have disinfecten the house, and no cases have followed.

12,819. After this woman died?—Yes. None of the occupants of the house have become infected.

12,820. Have you disinfected the house?—Yes.

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12,821. It is not a case in which you had not disinfected the house?—No; but we did not disinfect anything further than that house. We let the people in that block go away; they are in the Nassarpuri camp. The next case that occurred was a few days ago. A woman had plague. As she was sick she was taken out into the trans-Lyari area, about four miles away from here; and two other women in the same house, who were also ill, were taken with her. They all three had plague, and have since died. But none of the other occupants of the house or block developed symptoms of plague. We have simply disinfected the house, and nothing more. The whole of the block has been voluntarily evacuated, and there are about 100 people in the camp.

12,822. What was it you omitted to do here?—Nothing. We have not omitted to do anything. Only, I believe it was thought that we were not taking strict enough measures, in allowing these people to go into voluntary segregation, and allowing them to go back to the town to their work without keeping them in strict segregation, as was formerly the practice. If we were to insist upon compulsory segregation, we are afraid the result would be that the people would not inform us of the cases, that the infected people would be moved from house to house, and that the occupants themselves would go from house to house without our knowing anything about it. As a matter of fact, there is a certain amount of supervision exercised in these voluntary camps. We have an officer who goes and visits them, but we do not insist upon their doing anything. I know, as a matter of fact, in this camp that where cases have occurred after they had been taken out the people themselves have left the hut entirely, and burned all the bedding and clothes of the deceased. I know that as a fact.

12,823. And they gene rally do it?—As a matter of fact I think they will always do it themselves.

12,824. You have found the working quite satisfactory?—Yes. So far as we can see, it looks as if it would be very satisfactory indeed.

(Witness withdrew.)

Col. W. McConaghy, I.M.S.

Colonel W. McConaghy, I.M.S., called and examined.

12,825. (*The President.*) You are Principal Medical Officer in Sind?—Yes.

12,826. And you have been some time on duty in Poona?—Yes.

12,827. You were Civil Surgeon there?—Yes.

12,828. At what time?—I was six years altogether at Poona as Civil Surgeon.

12,829. During that time there was plague, I think, in Poona?—Yes, two epidemics.

12,830. You had some experience of plague in the Lunatic Asylum in Poona; you were in charge there?—Yes.

29,831. How many inmates are there in this asylum?—Generally about 100.

12,832. It is a small asylum?—Yes.

12,833. At what time did plague appear in this asylum?—There were no cases among the inmates of the asylum; none of the lunatics were affected at all, but we had a few cases among the servants.

12,834. How many?—One warder, one warder's son, and a dhobi.

12,835. These cases occurred within the walls of the asylum, I suppose?—They occurred within the asylum compound, in the servants' outhouses.

12,836. What was done?—They were removed at once for observation, to the Sassoon Hospital, and directly the disease was pronounced plague, they were sent off to the General Plague Hospital.

12,837. Did any further cases occur?—Not in the asylum itself. These were the only three.

12,838. Do you know how these patients were infected?—The disease was prevalent in the neighbourhood of the asylum, and there were some cases almost directly outside the gates of the asylum.

12,839. Some, if not all, of these people were in the habit of going outside?—Yes.

12,840. Did you disinfect the quarters which they had occupied?—The roofs were taken off the houses, the walls were disinfected, and all the floors were dug up, the earth removed, and fires burnt inside the houses.

12,841. Was it in consequence of this that you did some inoculations in the asylum?—It was done partly as a preventitive and partly as an experiment. We only inoculated half the lunatics.

12,842. With Haffkine's fluid?—Yes.

12,843. You had no plague subsequently in the asylum?—No.

12,844. Therefore, inoculation showed you nothing?—Nothing positive.

12,845. Did you observe any bad effects from the inoculations?—The majority of those inoculated had slight fever and pain in their arms, but nothing material.

12,846. Only inconvenience?—Yes.

12,847. There was no serious illness produced?—No.

12,848. While you were Civil Surgeon at Poona, your duties outside the hospitals brought you into contact with plague in several other localities, I believe?—I saw a great number of cases in their early stages in the city, in the cantonment and the suburbs.

12,849. Were you in Poona at the commencement of the plague epidemic?—No. I was on leave, but I was recalled directly.

12,850. You had charge of the railway operations, had you not?—I had charge of the Poona railway station for almost a year.

12,851. What was the nature of the measures adopted at the railway?—We had inspections of each carriage, and cases which were at all suspicious were sent to the Sassoon Hospital for detention and observation. If they developed plague during the first 24 hours or so, they were transferred to the General Plague Hospital and treated there.

18,852. Do you know how many persons were inspected?—Several thousands, I should think.

12,853. How many persons were detained; how many of the persons subsequently developed plague?—Forty persons developed plague, but there were 61 in all detained; 21 of the latter number were found suffering from other varieties of fever.

12,854. You also had charge of the Sassoon Hospital? Yes.

12,855. And you saw some of the earlier cases?—Yes. All the European cases were treated at this hospital; it was the General Plague Hospital up to 5th February, 1897.

12,856. When was the first case of plague admitted in the General Hospital?—The first case was admitted on the 8th October, 1896.

12,857. How had plague been acquired in this case?—The patient imported it from Bombay. He was one of the passengers taken from the railway station.

12,858. That was an undoubted case of plague?—Yes.

12,859. What further cases were there?—There were two other cases admitted during the month of October, 1896, which came from Bombay. During November there were no cases admitted, and during the month of December 63 cases were admitted These were all passengers from Bombay.

12,860. I suppose these cases were treated in your special wards?—In temporary sheds erected in the compound.

12,861. Did you have to extend your accommodation?—Yes.

12,862. These are all cases imported by the railway, I understand. When did cases begin to originate in Poona itself?—Up to the 5th February 1897 all the cases treated were imported were imported from Bombay and Kurla, which is one of the suburbs of Bombay. After the 5th February the majority of cases were local.

12,863. Do you think all the cases which were likely to spread the disease were intercepted on the railway?—I do not think they were at the commencement, but I think latterly they all were.

12,864. Was there any change made in the measures?—The measures were much more strict towards the end.

12,865. In what directions?—They had lady nurses to examine female passengers, and they always felt their pulse, and if any case seemed like fever the thermometer was applied. They were also examined for buboes or any other signs of plague.

12,866. You had lady doctors to help?—Yes, and European nurses.

12,867. Previously to that the examination was perfunctory, I understand?—Yes, more or less.

12,868. And a good many cases must have escaped observation?—Yes.

12,869. And so plague was imported into the city and cantonment?—Yes.

12,870. You think that is the origin of plague in Poona?—Yes. Patients who had been admitted into the hospital could leave the hospital and go to their houses in the city or cantonment if they wished. We had not sufficient power to prevent them leaving the hospital. Latterly we could prevent any person leaving the hospital.

12,871. There were certain defects at the commencement of operations?—Yes.

12,872. Even though you had actually diagnosed a case as plague, you had no means of preventing that person from going into the cantonment? — That is so.

12,873. Did you acquire that power afterwards?—Yes.

12,874. You have observations, I think, to show how the virus is introduced into the body?—Yes. I think in a number of cases it was introduced through abrasions or any little cuts on the surface of the body, if they came in contact with dust or earth in which plague germs were present.

12,875. You saw the abrasions in certain cases?—Yes. No direct experiments or observations were made in the hospital as to the causation of the disease. It was, however, noted in two undoubted cases of plague that the patients had small swellings, which appeared like hair boils, a little below the enlarged glands in the groins. In a third case the patient had received an injury (abrasion) on one side of the chest. He got fever about a week after, with a well-marked painful gland in the axilla of the same side. In a fourth case there were unmistakable signs of bubonic plague, with glandular enlargement in the left inguinal region, in a patient who, some days before admission, had received an injury on his left toe, which was then in an unhealthy-looking and contused condition. Again, in several cases the skin on the affected side was found full of scabies. This apparent connection between the injury of certain parts and the affections of the glands on the same side may, possibly, account for the entrance of the plague bacillus into the system.

12,876. You have some opinions with regard to the infectiveness and contagiousness of plague? — Yes. Personally, I think it is not very infectious or contagious.

12,877. Why do you say so?—Nearly all our Hospital Assistants and those who looked after the patients remained free. Very few of them suffered from the disease, and on that account I thought it was not very contagious. Some of the Europeans, I think, were affected by contagion.

12,878. You have some facts also relating to the Parsees, who were affected, which support the view that it is not contagious?—Yes. These cases were treated in their own houses, and none of the relations were affected.

12,879. How do you account for that?—I think the measures they adopted were successful. They used disinfectants, and all the vessels, and everything which had been used by the patient were disinfected before they were allowed to be taken from the room.

12,880. Has it come within your knowledge that, in a house where a case of plague has occurred, it has not been at all uncommon for some of the inmates of that house to be affected with plague?—Yes; in some of the houses, which are small, unhealthy, and badly ventilated, especially if the floors were of earth. In the better class of houses, which were well ventilated, and with upper storeys, very few of the friends who came in contact with the patient suffered.

12,881. Contagiousness is greatly lessened by certain circumstances?—Yes, by ventilation especially.

12,882. You account for the severe mortality in certain parts of the city also upon much the same grounds?—Yes.

12,883. You have some observations on the incubation period, I believe?—Yes. One case I saw from the commencement, a Mr. Kennedy, who is the editor of a local paper. So far as I know he was supposed to be quite well in the early morning when he went out with one of the search parties, and he was supposed to have contracted the disease by visiting some of the unhealthy houses in the city of Poona. He developed plague the same day. The Government sent out search parties to look for suspicious cases, and he accompanied one search party on the first day when such parties were sent out.

12,884. Do you remember what occurred to him?—Shortly afterwards he became very feverish and had a very high temperature.

12,885. On the same afternoon?—Yes. He suffered very severely from vomiting, and his digestive system was affected very much. He had severe headache. He was admitted into the hospital. It was an undoubted case of plague, one of the most severe among the European cases.

12,886. He had distinct enlargements of the right femoral glands and fever?—Yes.

12,887. Before this occurred, so far as you know, he had not been in any infected locality?—He had not been so far as he knew himself. He did not live in the city, but in the suburbs.

12,888. Where there had been no plague?—Yes.

12,889. You have also a case of a Parsee child, I think?—Yes; that child came from Bombay. That was a case of long incubation.

12,890. She had been in a part of Bombay where there was much plague?—Yes. She came to Poona, and was not affected with plague for 13 days. That was the longest case.

12,891. In the interval had she come in contact with plague?—So far as I know, there were no other cases in the immediate vicinity.

12,892. Of course, that was inquired into carefully?—Yes, we inquired into it very carefully at the time. The man who inquired into it is a very careful observer; he is one of the Assistant Surgeons, a Parsee, and a lecturer at the Medical School. He said he had no doubt about it himself. The case occurred on the 17th of December 1896.

12,893. I see, for the purposes of statistics, you have divided the hospital work into two periods?—Yes. At first all the cases up to the 5th February were treated at the Sassoon Hospital, but after that all the cases that were confirmed plague cases were transferred to what we call the General Plague Hospital at Sangam, about half a mile from the Sassoon Hospital.

12,894. What cases were then still being treated in the Sassoon Hospital?—All the cases sent in by the search parties and from the railway station were kept at the Sassoon Hospital for one or two days for diagnosis. Directly we diagnosed them as plague cases we transferred them to the General Plague Hospital.

12,895. Do your statistics refer only to those cases which were treated in the Sassoon Hospital or to those in the neighbouring hospital?—The first period is only for the Sassoon Hospital.

12,896. Can you give us figures?—During this period 176 cases were admitted to the hospital, of which 170 presented undoubted signs of bubonic plague. Six were cases of ordinary fever. Of the 170 on the date of transfer of the patients to the new hospital at Sangam there were only 18 remaining, several of whom were in a convalescent state. We transferred on the 5th February the 18 remaining cases from the Sassoon Hospital compound. Of the remaining 152 patients—that was deducting the six cases and the 18 from the 176—23·6 per cent. were discharged cured; three (equal to about 2 per cent.) left the hospital without permission (that was in the early days, when we had not authority to stop them); 113, equal to 74·4 per cent., died in the hospital.

12,897. You have many other facts and statistics bearing upon the question of the incidence of plague to each caste, the relation of the mortality and the incidence to sex, the locality of the bubo, with an

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account of the symptomatology and clinical features of cases of plague, and other points of interest; perhaps you will allow these to go in as part of your evidence? —Yes. I propose to divide the plague work done in the Sassoon Hospital into two periods, viz., 1st from 8th October 1896 to 5th February 1897, during which time all suspicious, as well as undoubted cases of plague were treated in this hospital. 2nd, from the latter date to the end of May, suspicious cases were kept under observation in the isolation wards of the hospital, and most of the cases amongst natives that proved to be genuine cases of bubonic plague were transferred to the General Plague Hospital; only European cases, as a rule, being treated here. I have already stated the results of 170 plague cases admitted during the first period. Of the 152 cases treated in the Sassoon Hospital 142 were Hindus equal to 93·5 per cent.; 5 equal to 3·3 per cent., Muhammadans; 4 Parsees, equal to 2·6 per cent.; and 1 Native Christian, equal to ·7 per cent. Of these 152 cases, 6 equal to about 4 per cent. were between 1 and 10 years; 17 equal to about 11 per cent., between 10 and 20 years; 95 equal to about 63 per cent., between 20 and 30 years; 24 equal to about 16 per cent., between 30 and 40 years; 7 equal to about 5 per cent., between 40 and 50 years; and only 3 equal to about 1 per cent., between 50 and 60. It would appear from these data that the largest number of cases occurred in comparatively young people between the ages of 20 and 40; this number being greater in the first half of that period. The largest number of cases were observed amongst males, the number being 136 males to only 16 females, *i.e.*, in the ratio of nearly 8 to 1. Of the 113 patients that died in the hospital, 102 were Hindus, 4 Muhammadans, 3 Parsees, and 1 Native Christian; the percentage of deaths in the different communities being 71·8 per cent. of Hindus, 80 per cent. of Muhammadans, 75 per cent. Parsees, 100 per cent. of Native Christians. Of the 113 deaths, 39 equal to 34·5 per cent. occurred within 24 hours after admission (2 of these dying within 1½ hours after arrival at hospital, 10 within 6 hours, and 9 within 12 hours); 30 equal to 26·5 per cent. within 2 days after admission, 11 equal to about 10 per cent. within 4 days, and of the remaining 14, 13 equal to about 11 per cent. between 4 and 9 days. Only one case died a month and eight days after admission into the hospital. This was a rather remarkable case, the patient having been admitted quite unconscious and with a feeble and almost imperceptible pulse. He developed bubonic swellings in the right groin and in both parotids, all of which suppurated and sloughed, leaving deep unhealthy ulcerating cavities. He was fed with nutrient enemata for about seven days, recovered consciousness and was apparently doing well when he suddenly died one afternoon from syncope. During the second period in all 61 cases were admitted in the hospital, out of which 40 proved to be undoubted cases of plague and 21 fevers of other varieties. Of these 40 cases, 25 equal to 62·5 per cent. were Hindus, 7 equal to 17·5 per cent. Muhammadans, 6 equal to 15 per cent. Native Christians, 2 equal to 5 per cent. Europeans. 33 of these 40 were transferred to the General Plague Hospital, 5 were in too weak a state for removal when their disease was diagnosed and died in hospital. The 2 Europeans were treated throughout in this hospital, and both recovered. One of the five cases that died in the hospital was under observation for four days; he was apparently doing well until a few hours before death, when he suddenly became very ill and buboes developed in both the parotid regions, death following soon after. 27 of these 40 cases were males and 13 females; 3 out of 40, equal to 7·5 per cent., were between 1 and 10 years; 7, equal to 17·5 per cent., were between 10 and 20 years; 10, equal to 25 per cent., were between 20 and 30 years; 8, equal to 20 per cent., were between 30 and 40 years; 2, equal to 5 per cent., were between 40 and 50 years; 6, equal to 15 per cent., were between 50 and 60 years; and 4 cases were over 70 years, equal to 10 per cent. In a great number of cases the symptoms of the disease were well marked when admitted, all of which had developed within a remarkably short time. The onset of the disease in almost all cases was sudden, and in about half the number the bubonic enlargement was noted almost simultaneously, with fever which in every case commenced with a well-marked rigor and the increase of temperature was rapid. The usual temperature noted was between 103° and 105° F. In only one case it went as high as 107° F., and in two or three cases only the temperature registered was below 103° F. The temperature in most cases was of a remittent character, but in some a distinct intermission was noted on the second day of the attack. The duration of the fever in the cases that recovered was a little over a week, the falling of temperature in the majority of these being by lysis. The pulse in the beginning of the attack kept pace with the temperature, its frequency being increased, and its character bounding and full. It soon changed, and the pulse-line in the majority of charts stood relatively below that of the temperature. Respirations were hurried and oppressive, the breathing in many cases resembling in character an attack of pneumonia; this latter symptom was more marked in those cases that did not present characteristic bubonic swellings, and which have been elsewhere described as cases of pleuro-pneumonia. The bubo appeared in the majority of cases simultaneously with fever, but in some its appearance was delayed from three to (about) eight days. In 34 out of the 152 cases, or nearly 29 per cent., the bubo could not be made out even after the most careful examination; almost all these cases presented grave cerebral and respiratory symptoms, the respiration rising to 70 or 80 per minute. In a few of these cases some hæmorrhage from the lungs was noted, but none of the characteristic physical signs of pneumonia could be detected except slight rhonci and sibilant rales in a few. The most frequent site of bubo was in the femoral region. As a rule only one gland was found enlarged; but in some two, and even three or more glands were affected. Only 22 of the total 118 cases with bubonic swellings had more than one gland enlarged. In the remaining 96 cases, presenting a single glandular swelling, about 45 per cent. presented a bubo in the femoral region, 19 per cent. in the axillary, 18 per cent. in the cervical, about 17 per cent. in the inguinal region. The bubo was present in 30 out of the 36 cases that recovered. In 19 of these the gland or glands suppurated, and in the rest absorption apparently took place. The bubo when opened discharged a thin sanious, inoffensive, purulent matter, and the wound thus produced, as a rule, healed slowly. In 31 out of the 40 cases observed during the second period described above the bubo was present. Of these 31, in five cases the bubo was found in more than one situation. In 12 of the remaining 26 cases the bubo was present in the femoral region, the left being more frequently affected than the right. In six cases it was in the axilla (five being in the right, and one in the left); in four it was in the cervical region, all on the right side; in three in the inguinal region, all of them being on the left side; and in the remaining case it was presumed the mesenteric glands were the seat of affection owing to the severe and excruciating pain that was present in the abdomen. Almost every case proved fatal in which a bubo, instead of gradually enlarging and suppurating, subsided before the constitutional symptoms showed signs of improvement; this subsidence of bubo was most frequently observed in the axillary gland, and all such cases except two died. In one of the two that recovered the gland suppurated, in the other apparent resolution occurred. The tongue presented a characteristic appearance, the whole of its surface being covered with a thick shining white fur; sometimes, however, the tongue was red at the tip and edges. There was a peculiar sickening odour generally observed in most cases emanating from the breath. Vomiting was present in a large number of cases, and in a few the vomited matter contained round worms. Constipation was the rule, but diarrhœa was also observed in some cases; the latter was often an unfavourable symptom. The liver and spleen were apparently little, if at all, enlarged in any case except two, in both of which the enlargement was due to old malarial cachexia. Both these cases died. Symptoms referable to the nervous system were present in almost every case from the first, and in a few, where they were absent in the beginning, they came on within two or three days; headache and a low muttering delirium were most usually observed in thin, debilitated, and old subjects; violent delirium in strong and young individuals. Convulsions were a prominent symptom in children, and in nearly 50 per cent. of cases coma preceded death by several hours. One of the women was pregnant, and aborted a short time before death. The facial expression of the patients was almost characteristic: a dull, drowsy appearance as if the patient had been under the influence of a narcotic drug, extreme pallor of the face, deeply injected and jaundiced eyes, faltering and broken speech, and low husky voice were present in almost every case. These indi-

cations, together with a rapid onset and development of the disease, accompanied by severe nervous and cardiac prostration, often helped in the diagnosis of those cases in which the characteristic glandular enlargement was absent.

12,898. I understand these remarks are founded on your own observations?—Yes. There is one thing omitted in the symptoms which I look upon as most important, and that is gait. I think the staggering gait of the patient is almost more characteristic than any other symptom.

12,899. At what period of the disease do you notice it?—Almost at the early stage, directly the fever commences. The patients generally walk with a staggering gait; they seem to be partially paralysed, and to lose control over their legs especially.

12,900. It should be mentioned among the earlier symptoms?—Yes.

12,901. Then with regard to the condition of the voice?—The voice is very peculiar; it is a kind of whispering voice; but that is not in the early stages; it is after some time, when the disease has more or less developed.

12,902. The voice becomes weak?—Yes.

12,903. Do you find the patients become voiceless?—Almost so, but not quite.

12,904. Aphonia is common?—Yes.

12,905. Aphasia is not observed?—Not by me.

12,906. Have you any facts with regard to the treatment? Will you tell us if there is any treatment which, in your experience, definitely improves the condition of the patient?—Personally, I have much faith in stimulants and preparations of either nux vomica or strychnine and digitalis.

12,907. From your personal observation, is there any kind of treatment which seemed definitely to improve the course of the disease?—I do not think so.

12,908. With regard to local treatment, what do you do, and with what results?—We keep the patient very quiet. The local treatment is generally belladonna. I always found preparations of belladonna were more useful than others. Then we opened the bubo. In a few cases we opened the bubo before it was quite ready, but I think it is advisable, in most cases, to wait till the bubo is quite ready for opening, when suppuration has taken place.

12,909. Did you see many cases of pneumonic plague?—I saw a good number.

12,910. Are they difficult or easy to discover?—I do not think they are very difficult to discover after the symptoms are fully developed.

12,911. To what symptoms would you chiefly trust?—The sputum was not so well marked. I should go by the stethoscope, a physical examination of the lungs.

12,912. I suppose there is a good deal of dulness?—Yes, but we nearly always get the crepitations, minute and sub-crepitant. We got them in all the cases I have seen, and I have seen a good number of them.

12,913. Could you, in most cases, detect the condensation of the lung by physical examination?—In most cases.

12,914. When you could not, how could you determine there was pneumonia?—From the symptoms. The respirations are very much more hurried than in ordinary cases. The respirations were hurried in all cases, but it was very much quicker in pneumonic cases.

12,915. Did these pneumonic cases occur throughout the epidemic, or at any particular period in the epidemic?—I think there were a few cases at all times, but more towards the middle of the epidemic, when the epidemic was very severe.

12,916. Did you determine the case mortality in the pneumonic cases as distinguished from the other cases?—No, I do not think I have. Most of the cases of pneumonia which I saw were cases occurring outside, before they were despatched to the different hospitals. Some of the people did not report their cases at the commencement of the disease.

12,917. Did you have pneumonia with buboes?—Not often.

12,918. Did you ever?—At the present time I do not recollect one.

12,919. Did you see anything of the septicæmic variety?—I have seen a few.

12,920. Are they difficult to diagnose?—Yes, and, as a rule, I think they are much more fatal.

12,921. Did you have any bacteriological examinations made in any of those cases?—I did not make them myself, but there were a few made, and the disease was detected in some. We had two officers attached to the Sassoon Hospital doing bacteriological work for some time, two young doctors sent out from home, Dr. Cayley and Dr. Marsh, now in Bombay. They were for some months in the hospital doing bacteriological work.

12,922. You had under your own observation and treatment a large number of cases?—Yes.

12,923. Have you ever observed any extensive œdema of the anterior surface of the body?—Nothing very much.

12,924. Have you seen any œdema?—I have seen slight œdema of the face occasionally, and a little perhaps of the feet, but nothing like what you would get in diseases of the kidney.

12,925. There was no remarkable œdema of the thorax or abdomen?—No, not more than you would get in any ordinary disease when the patient become weak.

12,926. You had nothing to do with the *post mortem* examinations themselves?—No, I saw two or three.

12,927. You have made some report upon the plague arrangements for Europeans?—Yes.

12,928. How many Europeans were affected?—Seventeen Europeans and 16 Eurasians.

12,929. Was there anything in the symptoms or case mortality at all different from those of the natives?—We only lost one European.

12,930. There was a distinct difference?—Yes.

12,931. How many Eurasians died?—There were six deaths among the Eurasians.

12,932. Therefore the Eurasians suffered more?—Yes.

12,933. Did you see these European patients?—Yes.

12,934. Was there anything strikingly different in the syptoms?—The Europeans suffered very much from depression, headache, sickness, nausea, insomnia and delirium. These were the chief symptoms. Delirium was particularly marked in most of the severe cases among the Europeans.

12,935. Was there any difference in the symptoms of the disease in the Europeans as contrasted with the natives?—No, it was exactly the same, except that the Europeans seemed to have more strength. Cases among the Europeans ran a longer course than among the natives.

12,936. They seemed to have greater resisting power?—Yes.

12,937. Did any of the attendants in the hospital become affected with plague?—There were two, a student and an ayah, those were the only ones.

12,938. Were they fatal?—No, they both recovered. The student had been inoculated in the arm with the prophylactic fluid. He was the only inoculated case which was attacked so far as I remember. He was inoculated on the 20th March.

12,939. Have you the details?—I think you could get them from the Civil Hospital at Poona. The student was under treatment in the Sassoon Hospital, although it was against the rule. We treated him in the European Plague Hospital, because he had contracted the disease in looking after the European patients.

12,940. Among all the cases of plague of which you have told us, this was the only case in which the patient had been inoculated?—I am almost certain that that is so.

12,941. What is your opinion as to the kind of building which is most suitable for the treatment of plague cases?—The one which we had specially erected at the Sassoon Hospital was a fairly high building with a corrugated iron roof and teak supports or pillars all round. We had corrugated iron for outside walls and cloth or calico inside.

12,942. Did you endeavour to get any special air space for the patient, or was the place so open that it was not necessary?—It was not necessary, because the

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accommodation was ample. We had very large rooms made with sufficient accommodation for all and plenty of ventilation.

12,943. How far are tents suitable as hospitals?—We had the Europeans treated in tents in the early part, but it was in the month of October, and we found them much too hot. In the cold season they would probably answer very well. We had to remove some of the patients from the tents and take them into buildings. The temperature outside was over 100° and it seemed to affect the patients in tents and their temperature rose also.

12,944. (*Dr. Ruffer.*) I believe you were the first European in Poona to be inoculated with Haffkine's prophylactic fluid?—I think I was the first European. There were only two inoculated that day, and I think I was the first.

12,945. Do you know how Haffkine's prophylactic fluid was standardised in Poona?—It was 3 c.c. that was given for the full dose on the first occasion.

12,946. What I mean is this, was any attempt made at standardising it, or was the dose injected that which was written on the bottle?—I think what was written on the bottle. It was Haffkine himself who performed the operations.

12,947. Will you kindly give an account of your symptoms after inoculation?—I was inoculated in the morning, and I felt a little seedy during the day, and slight headache. As far as I myself was concerned I had no rise of temperature in the evening. I went to bed and I slept fairly well, but on the following morning I had slight fever. The temperature rose during the day to a little over 102—between 102 and 103, but it never went beyond 103. The pain in the arm commenced the second day also. I scarcely felt it the first day with the exception of a slight itching sensation, so far as I remember now. On the second day it became painful and red, and the swelling gradually increased, it almost extended to the fingers, and up my arm. I also had a slight swelling in the axilla.

12,948. Do you mean an enlarged gland?—The whole axilla was inflamed.

12,949. How long did that swelling last?—So far as I remember, in my own case, I think it was ten days.

12,950. Were you able to use that arm during that time?—I used it for the first day, it was the left arm. After the second day I kept it in a sling for two or three days, as it was painful—or I kept it supported in my buttoned coat.

12,951. Was the arm red or inflamed?—Yes, it was red almost the whole way—both the forearm and the arm were red.

12,952. Your temperature rose to between 102 and 103; for how many days was it raised?—It kept on for one or two days and then it passed off and returned again. I had three or four slight attacks of fever during the first week or ten days.

12,953. Are you aware whether anybody else was inoculated with the contents of the same bottle used for yourself?—An Assistant Surgeon at the Sassoon Hospital was inoculated, so far as I remember, with the contents of the same syringe.

12,954. Could you tell us what his symptoms were?—His temperature rose much higher than mine. It rose to 105 on the second day. He also had a slight pain and swelling of the arm, but not to the same extent as I had. He had only half the dose, 1½ c.c., while I was given the full dose, 3 c.c.

12,955. How long after the inoculation did the temperature rise to 105?—The following day. I saw him the next day about one o'clock and he told me that his temperature had been 105. It was then 103, but it had been up to 105.

12,956. Were the general symptoms marked?—He had the pain and swelling, but he was not confined to the house. He was out and moving about.

12,957. Did either of you have any vomiting or diarrhœa?—I had none myself, and I do not think that he had.

12,958. Did the local symptoms in your case resemble cellulitis? Could you have mistaken your case for one of cellulitis?—Only in the early stage. It never went on to suppuration. There was acute inflammation and induration of the lymphatic glands, all along the course of the lymphatic glands.

12,959. Were you laid up?—After the second or third day; I think I remained at home a day and a half or two days, but I was not confined to bed.

12,960. Did you notice any dangerous symptoms in other cases inoculated with Haffkine's prophylactic fluid?—I cannot say that I did.

12,961. Nothing to make you fear for the person's life?—No, nothing.

12,962. You inoculated half the inmates of the Lunatic Asylum?—Yes, about half.

12,963. Were the temperatures of the inoculated inmates taken systematically after the operation?—They were taken for two or three days by the Hospital Assistant. I was there every morning and evening and he took the temperatures twice a day. He had an account of it when I was there, but so far as I recollect no temperatures rose beyond 103.

12,964. Did some of the patients show no rise of temperature at all?—I think the temperature did not rise in a few cases.

12,965. You saw some of the Khojas who were inoculated in Poona?—Yes, I was present, I think, when the majority of the Khojas were inoculated at Aga Khan's private bungalow.

12,966. You saw a great deal of inoculation generally?—Yes.

12,967. Could you tell us whether there was any selection made among the people who presented themselves for inoculation?—In all the inoculations I performed, or saw myself, we examined the patients, and any of the patients that were suffering from fever or any skin disease, or weak chest, were recommended not to be inoculated.

12,968. Debilitated persons generally? — Yes, generally.

12,969. I suppose most debilitated persons, or persons actually ill, would not come to be inoculated at all?—As a rule they would not.

12,970. And any person that you considered in weak health was not inoculated?—They were advised not to be. In some instances I think they wished to be, but then they were only given a very small dose.

12,971. Did you get any cases of deaths in the inoculated people?—I do not remember having seen a single death.

12,972. Did you not tell us that there was one case of plague, a student?—That was a case after inoculation, but he did not die; he recovered.

12,973. You did see this case of plague after inoculation?—Yes; he was a medical student that we had in the school at Poona. That was the only distinctive case that I remember at the present time.

(Witness withdrew.)

Mr. E. Mackenzie.

Mr. E. MACKENZIE called and examined.

12,974. (*The President.*) What are your medical qualifications?—I have the diploma of the Medical College, Bombay.

12,975. You are also Health Officer at Karachi Port?—Yes.

12,976. (*Dr. Ruffer.*) You have been in charge of the port during the last two epidemics?—Yes.

12,977. We have had most of the facts concerning port inspection from Dr. Jenney yesterday, so that I need not trouble you about them. You say in the précis of evidence supplied to us that out of 140 outgoing passengers sent to the detention camp as being suspicious, 14 cases developed plague; how many died?—Nearly all died.

12,978. What form of plague did they suffer?—Mostly bubonic.

12,979. Typical cases of plague?—Yes. They were not pronounced to be plague unless they were typical cases. They were sent on shore for observation and typical cases only were pronounced as plague.

12,980. At a later date all the passengers were detained for ten days and disinfected, and 20 cases occurred

amongst the outgoing passengers thus detained?—Yes.

12,981. What became of those cases? Were they all typical cases of plague?—Yes, about 70 per cent. of these cases died.

12,982. Could you add to your report an exact statement concerning each of these cases?—Yes. [The witness afterwards added a note as follows:—Six of these cases were sent to the Plague Hospital at Karachi, and I heard no more of them. Fourteen were sent to the Plague Hospital at Manora. Eight of the latter died, and six recovered. Eleven had buboes, three had not; two of the latter had aphasia pointing to cerebral derangement. Both were fatal. The bubo was single in nine of the cases, double in one, and in one case there were six buboes.]

12,983. Are you of opinion that plague entered Karachi either by cargo or by rats?—Yes.

12,984. Could you tell us why you think that is the case?—First with regard to cargo. Cases in Karachi did not occur in people who came from Bombay; they occurred among those who lived in Karachi and in a part of Karachi which was not in free connection with Bombay as regards human intercourse. In the number of people detained for observation in Manora, not one case of plague was seen. Some ships came with infection reports—a case of plague was reported on the way—and those people were detained for ten days in the camp, but no case of plague occurred amongst them.

12,985. Were the clothes of the people coming from Bombay disinfected here?—Not in the first epidemic.

12,986. How long were the passengers detained?—They were not detained at all unless they came by infected ships. They were all inspected and let go.

12,987. Was there any corpse inspection in the town before the first epidemic?—Not at the beginning.

12,988. How can you be sure that the first cases were among the people in the town? Might not a case from Bombay have escaped observation?—Possibly.

12,989. Have you any other reasons for thinking that the plague was brought in by cargo or by rats?—In the second epidemic the clothing of all people coming to Karachi was disinfected. That precluded the possibility of its coming by clothing, to some extent. The people were detained for ten days. Only a few cases of plague occurred amongst these people. We had no proof that the infection was spread from those cases.

12,990. Was the clothing of the crews on board the ships disinfected?—Not the steamers, but the clothes of the crews of the country craft which came here were.

12,991. Not steamers coming from Bombay?—No.

12,992. I believe some members of the crews went on shore in spite of prohibition; one man was caught, was he not?—I do not know that. It is possible a few escaped.

12,993. Have you made some observations on the diminution in the number of cases of malarial fever during the epidemic of plague?—Yes; three years ago with an ordinary rainfall we had a very large number of admissions with intermittent fever. In the following year with an equal amount of rain; during the prevalence of plague the fever cases fell off—the number of admissions with fever dropped very considerably. It might be accounted for by the presence of plague itself, because the attendance was smaller.

12,994. Are you in charge of the hospital?—Yes.

12,995. How many cases of plague were imported by sea in 1897?—Nine.

12,996. And in 1898?—Seven.

12,997. Could you give us some information concerning three cases which occurred in one family at Manora?—I mention this case because I was in charge at Manora. They came from Mandvi. They had been on board the steamer 24 hours. There was a case of pronounced plague on board, and he was sent on shore to the Manora Hospital. While he was there two of his little children came to see him. They were under observation, having come by steamer before, and they too were found suffering from plague. There were three cases of plague occurring in one family who had come from Mandvi by two different steamers. About ten days after these cases had arrived at Karachi some of the friends were discharged from the camp, having put in their ten days. One case of plague occurred in Manora; of course we had had cases before. One case occurred in the Cutchi Lines in a Muhammadan; he had the pneumonic form of plague. We were in doubt about this case being one of plague at first, but a day or two after a little girl in the same house was seized and had an axillary bubo. The first case died, and the child was removed to the hospital with five others who were living in the same house. Three more developed the pneumonic form of plague.

12,998. What was the connexion between the three first cases and these last five cases?—They were in the same family. Perhaps some clothing which had escaped disinfection may have carried the infection. They are very apt to secrete some of their clothes.

12,999. This was during the first epidemic?—Yes.

13,000. There was no disinfection then?—There was disinfection in the camp—actually infected people were disinfected.

13,001. I understand that four out of the second lot of five were pneumonic cases, and one bubonic?—Yes.

13,002. Could you trace any other cases from these?—No. The roof of the house was opened, and the house was disinfected with perchloride of mercury, and there were no cases after that.

13,003. Can you give us any information as to infection from person to person?—I give one case, because the facts are pretty certain. Two brothers lived at Kiamari, in the Police Lines, rather a clean quarter. One brother was a policeman, and one was a coolie. The coolie worked on the Native Jetty, where the cargo from Bombay is landed. He got fever and a bubo. I saw him. He was removed to the hospital at Manora from Kiamari. His brother went with him to attend upon him. The first man went to the Manora Hospital on the 31st March 1898, and died on the 9th April.

13,004. He had pneumonia, had he not?—He got pneumonia afterwards. When he died his brother apparently was all right, but having been with his brother he was kept there for ten days. On the 13th he got fever, although he had no bubo. He had aphasia, and all the other symptoms of plague.

13,005. What other symptoms of plague had he got?—High fever, delirium, staggering gait, great prostration, and aphasia.

13,006. He was seized with plague on the 13th April?—Yes.

13,007. That would be an incubation period of four days?—Yes.

13,008. Were there any other cases of plague in the hospital at the time?—Yes, there were a few cases.

13,009. Could he have infected himself from any of these cases?—He was in one ward by himself with his brother—in one compartment.

13,010. Was he kept in the ward after his brother died?—Yes, but in another compartment.

13,011. Was the ward disinfected between the death of the first and the onset of the second case?—Yes.

13,012. Do you think he could have infected himself in any other way?—No. The compartment was one by itself. We had a few cases of plague which had gone into the hospital, but this compartment was healthy.

13,013. Did he come into contact at all with people who were nursing other cases?—Possibly he did. He was seen wiping the mouth of his brother and kissing him.

13,014. Were the second man's clothes disinfected after the brother died?—Yes.

13,015. Nothing escaped?—No. All the bedding and matting was destroyed and burnt.

13,016. Do you know of any cases in which the incubation period exceeded eight days?—Most of the cases which I know have been within eight days, except the one I refer to.

13,017. You have in your précis given some others coming from Bombay?—Yes. That is the only one in which we have correct data to work upon.

13,018. Will you give us particulars of the case?—Yes. Bakar Shah was admitted in the detention camp on the 18th March. The rule was 10 days' detention. He came from Bombay and arrived in Karachi on the 18th. He was two days coming from Bombay. On the 24th March he was attacked with plague.

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13,019. On what day was he disinfected?—On the 18th March, the very day he arrived and came into camp.

13,020. Was there any plague in the camp?—No.

13,021. Had everybody in the camp been disinfected?—Yes.

13,022. His clothes might have been infected and he might have got infection on the 18th March when he entered the detention camp?—Yes, it is possible, but unlikely.

13,023. That would make an incubation period of six days?—Yes. The difficulty comes in in finding what the period of incubation is in cases where there is a possibility of infection from clothes after the person has been exposed to infected human agency.

13,024. You give a statement in your précis of 101 cases in which you have noticed the site of the glands?—Yes, I put that statement in. It is as follows:—

Site of Buboes.	No. of Cases.	Died.	Recovered.	Remarks.
Axillary glands -	8	7	1	These 101 cases were closely observed by me. There is absence of implication of abdominal glands in all,—showing that infection through the stomach was not seen. About 140 cases of plague (including the 101 referred to in the table) were seen by me altogether.
Inguinal gland -	19	10	9	
Cervical gland -	8	4	4	
Femoral gland -	46	27	19	
No glands - -	10	7	3	
Pneumonia - -	10	10	0	
	101			

13,025. Do you think the site of the glands is of any prognostic value? Do you think more cases recover when the inguinal glands than when the axillary glands are affected?—I do not think so. But I would say this, that if the gland affected is confined to the femoral region pointing to a local source, such as an abrasion on the foot, the case is favourable.

13,026. Have you any evidence as to the value of curative serum?—Very little.

13,027. You can speak of nine cases; are they the same as Dr. Jenney saw?—Yes

13,028. Have you any evidence with regard to Haffkine's prophylactic fluid?—I inoculated ten persons; but only three of those were exposed to plague, so that I am not in a position to say anything positively.

13,029. You have some notes about aphasia as a symptom; that is a common symptom, is it not?—Not common; 5 per cent. I have observed.

13,030. It is a serious symptom?—Yes, it is a very fatal symptom.

13,031. How did you diagnose plague in the cases which had no buboes?—Partly from the surroundings.

13,032. What were their symptoms?—In the absence of epidemic those cases would have been very doubtful, but in the presence of an epidemic, coupled with other symptoms, they were pronounced as plague.

13,033. What were the symptoms?—Fever, temperature of 105 and 104, delirium, staggering gait, a sluggish look, suffused conjunctivæ, headache, feeble pulse, peculiar tongue, and cardiac failure. Cardiac failure was a very prominent feature.

13,034. They died very quickly?—Yes.

13,035. Still, three cases recovered out of ten?—Yes.

13,036. Did these three cases get buboes ultimately?—No.

13,037. How do you know they suffered from plague?—They came from infected areas.

13,038. How did you differentiate these cases from cases of other acute infectious illness, say, an acute attack of malaria?—From the connection with other plague cases more than anything else.

13,039. Nothing in the symptoms?—Nothing particular in the symptoms.

13,040. I believe you say the cases of pneumonia were invariably fatal?—Yes.

13,041. Were they primary pneumonia or secondary pneumonia?—The cases I have mentioned as pneumonia were primary.

13,042. They had no buboes?—No.

13,043. Did you make a microscopical or bacteriological examination in any case?—No.

13,044. (*The President.*) The voice became very weak in a large number of your patients?—Yes, in some of them.

13,045. Did it fail in any of them?—The speech failed in five.

13,046. There was aphonia but not aphasia?—I called it aphasia. In a few cases there was a little meningitis.

(Witness withdrew.)

Capt. N. Rainier, I.M.S.

Captain NORMAN RAINIER, I.M.S., called and examined.

13,047. (*The President.*) You were employed on plague duty, I believe, in the Palanpur State?—Yes.

13,048. (*Mr. Hewett.*) Palanpur State is on the borders of the Bombay Presidency adjoining Rajputana, is it not?—Yes.

13,049. Have there been two epidemics of plague there?—Yes.

13,050. Were you present during the first epidemic?—No.

13,051. Perhaps you can, nevertheless, give us some facts giving the total number of cases?—There were 141 cases and 90 deaths in the first epidemic.

13,052. When did it occur?—In the middle of February 1897.

13,053. When did it terminate?—At the end of May 897.

13,054. Do you know how plague was introduced on this occasion into Palanpur?—The first case was a Banniah who had gone to Bombay on business and returned. He died of plague two or three days after his return.

13,055. Do you happen to know whether this was a bubonic case?—Yes.

13,056. Did the second epidemic commence in the same quarter of the town as the first one?—Yes.

13,057. In what month?—August 2nd, 1897.

13,058. So far as you have been able to ascertain were there any cases in the months of June and July?—There were no cases so far as I could make out. I arrived on September 22nd.

13,059. When you got there did you find anything to prove re-infection from some other place?—There was the history of the first case. He was also a Banniah, and he had been to Bombay on business.

13,060. When did he return to Palanpur?—On the 30th July.

13,061. Was his the first case?—That was the first recorded case.

13,062. Was that also one of bubonic plague?—Yes.

13,063. Did it spread among the residents of Palanpur after that?—Yes.

13,064. Did the next cases take place in this Banniah's house?—Yes; his brother was the second case which was reported.

13,065. Did it proceed to other houses?—It was confined to that quarter first of all, and it gradually spread to other quarters of the city.

13,066. Is there any doubt as to how the infection came?—I think there is no doubt.

13,067. The town of Palanpur is a walled town, is it not?—Yes.

13,068. What is the population?—21,000.

13,069. What arrangements were in operation when you got there?—There were four caste hospitals for the sick and a small segregation camp attached to each for the relatives of the sick and those living in

adjacent houses. There were search parties of the Darbar sepoys to try and discover cases.

13,070. Were the whole operations conducted by the State?—Yes, by the Darbar doctor.

13,071. Did you take any measures to alter the arrangements in operation?—Yes.

13,072. Will you describe to us what you did?—I divided the city into four wards and placed each ward in charge on a native gentleman, one of the Darbar officials. He was also placed in charge of a search party. We had a medical examination of the city two or three times a week, of each quarter separately.

13,073. Did you find that you got intimation of the occurrence of cases fairly well?—Not at first; they tried to conceal them as far as possible.

13,074. Did any people leave the town?—A good many.

13,075. What proportion do you think left the town?—Quite a third left before the city was evacuated.

13,076. Where did they go and settle themselves?—A good many of them went to the villages round about, and a good many went to two or three large villages in Baroda which adjoins Palanpur.

13,077. Did you find after you had been in Palanpur for a time that there was a decline in the disease?—Yes.

13,078. When did that begin?—In the week ending 24th September, that is the eighth week of the epidemic.

13,079. Immediately after your arrival?—Yes.

13,080. Did anything occur to cause it to rise again?—At the Diwali festival a lot of people came back from the adjacent villages to visit their temple, and the number of cases immediately went up.

13,081. Did you evacuate the whole city?—Not till after the Diwali festival.

13,082. When did you evacuate the city?—On the 2nd November.

13,083. By that time how many people had you to turn out of the city?—I should think there were between 13,000 and 14,000.

13,084. Where did you put these people?—About 8,000 of them built huts for themselves outside the city. There were large mango groves outside the city, and they built huts underneath the trees. Three or four thousand escaped into the other villages round about.

13,085. Did you permit the people who went into huts in the neighbourhood of the city to take their sick with them?—No. When they went out all the sick were obliged to come into the hospitals.

13,086. What did you do with the contacts?—The contacts went into the segregation camps. Before the city was empty they were allowed to take the sick outside into the groves, but when complete evacuation was ordered the sick were taken to the hospitals, which were also outside the city.

13,087. Were you able to prevent people from going back into the infected area?—Yes; we had all the gates shut except two, and there were guards at those two gates.

13,088. Do you think that the arrangements were satisfactory to prevent them from going back?—After total evacuation, yes.

13,089. Having got them out of the town did you proceed to disinfect?—Yes.

13,090. Did you disinfect uninfected as well as infected houses?—Yes.

13,091. Will you describe to us the manner of your disinfection?—A third of the roof was removed, including the ridge tiles, and both sides of the slope of the roof. The floors and contents were then sprayed with a 5 per cent. solution of carbolic acid. All moveable articles were taken outside, and useless, dirty razais,, rags, &c. were burnt in front of the house. The floor was dug up for a depth of two inches, and the whole interior, roof, walls, and floor sprayed with carbolic solution, and the walls covered with a thick coating of lime as well. The moveable furniture was then disinfected and replaced, and the houses locked and sealed.

13,092. Did you dig the floors up?—We dug the floors up at first, about a third was dug up. Then, afterwards, we left the floors alone and simply soaked them with carbolic solution.

13,093. Did you use any perchloride of mercury at any time?—Yes, for about three-quarters of the city we used perchloride. We had not been able to get it before.

13,094. When you obtained the perchloride of mercury did you cease to dig up the floors?—Yes.

13,095. When did plague cease among the city people?—The last case in Palanpur was on the 1st January 1898, but the people were permitted to return on the 15th December.

13,096. Did you permit them to return because there were no cases at the time?—There were no cases at the time; these other cases were imported from outside.

13,097. When you permitted them to return, what precautions were taken before they re-occupied their houses?—Previous to re-occupation, the Supervisors had prepared lists of the families living under their charge outside the city. On 15th December, these people were allowed to re-occupy their houses without previous disinfection of clothing or persons. Each was provided with a small ticket, bearing his name and the head of the family on it; the head of the family had a larger ticket with the names of the members written on it; each person was medically examined by myself, and his ticket signed and dated by me. All arrivals by road or rail, unprovided with passes from Plague Authorities, were detained in an observation camp for 10 days, and after disinfection and examination were provided with a signed ticket. The better classes were allowed to make their own arrangements for residing outside the city for 10 days, subject to medical surveillance, before receiving a ticket. Persons with passes were at once given tickets, but had to present themselves daily for inspection for 10 days. On entering or leaving the city gates and on the visits of the Ward Supervisors, these tickets had to be produced. Persons found without them were taken to an observation camp for inquiry. Persons leaving by rail had to deposit their ticket with their Supervisor, receiving it on their return, and being kept under observation by the Supervisor.

13,098. Was the re-occupation of the city followed by any recrudescence?—No.

13,099. Did any imported cases occur?—There were several.

13,100. Can you detail them?—Seven or eight imported cases were detected, chiefly among members of the disinfecting parties sent to the villages. Two of these cases were, however, concealed in the city—one for two days; the other, a woman, who had completed 10 days in an observation camp, for over 10 days in various parts of the city. This woman developed plague two days after leaving the observation camp, and had come from an infected village. The various houses in which she had been concealed were discovered, large areas round them evacuated, and the houses all carefully re-disinfected. No further case occurred.

13,101. What was the total number of cases and deaths in the city?—674 cases and 413 deaths.

13,102. How many of these cases were bubonic and how many pneumonic, approximately?—The majority were bubonic.

13,103. There were a certain number of pneumonic cases?—Yes.

13,104. At what stage of the epidemic did you observe these pneumonic cases most?—Chiefly at the height of the epidemic.

13,105. When the epidemic was at its worst?—Yes.

13,106. What treatment did you give?—We gave no treatment at first because the people objected to it, and they had their own native medicines. The Native State doctor gave them his own medicines. Afterwards we persuaded them to take stimulants and purgatives.

13,107. Did any benefit result from the treatment?—No. They seemed to recover whether they were treated or not.

13,108. In addition to infection of the city, there were certain villages of the Palanpur State which were affected during the second epidemic?—Yes.

13,109. Were they affected in the first epidemic?—No,

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13,110. When was the infection of the villages discovered?—The first village was affected on the 30th September 1897. Early in October two villages were found to be infected. In each case the first persons attacked were people who had recently arrived from the city of Palanpur to escape the plague and reside with their relatives. In the villages infected later the infection was always traced to persons arriving from a previously infected village.

13,111. I suppose that in the early stage of the infection of the villages you were occupied in the town and could not attend to the villages?—I could not get out very often.

13,112. What measures were taken in the first stage? Did you evacuate the village wholly?—No, we partially evacuated it.

13,113. You evacuated the infected blocks?—Yes.

13,114. Had you any Europeans to assist you there?—In November I had three European officers.

13,115. Before their arrival how did you arrange for the partial evacuation of the village?—The Palanpur officials went out with me. I pointed out what they should do, and I went out once or twice to see if the measures had been carried out.

13,116. Did you find this partial evacuation to be successful?—It was successful in three villages.

13,117. How many villages did you evacuate partially?—22.

13,118. What was the highest and lowest population of these villages?—The highest is 3,444.

13,119. What was the size of the three villages in which you found partial evacuation to be successful?—One was a village of 1,600 inhabitants, the second 2,000, and the third 300 or 400.

13,120. How many cases occurred in the village of 2,000 inhabitants?—There was no case after evacuation.

13,121. One imported case only?—Yes.

13,122. How many cases were there in the smaller villages?—In the third village, with 400 inhabitants, there was only one case, and that was believed to be imported. In the village with 1,600 inhabitants there were nine cases and five deaths.

13,123. How many of those were indigenous?—Eight.

13,124. Did you come to the conclusion that partial evacuation was not effective?—Yes.

13,125. Then what did you resort to?—Total evacuation.

13,126. At what date did you begin that?—There were several villages evacuated before the 1st January 1898, but after that date nearly every village was evacuated within 24 hours if possible.

13,127. Did you at that time devise any better system for getting information as to the occurrence of plague?—Yes.

13,128. What was that?—Early in January, acting on a letter, circulated by the Government of Bombay, of Major Anderson, I.M.S., Deputy Sanitary Commissioner, Nasik, we resolved to carry out immediate evacuation on first report of plague or dead rats in any village. A better system of obtaining information was introduced also. Patels of villages within a radius of 12 miles from Palanpur (at this time including all the infected area) were ordered to send in daily reports of all cases of sickness or death occurring in their villages. Vaccination was stopped, and the vaccinators were instructed to go round the villages in their district and bring in any local reports, true or otherwise. Their information was often exceedingly useful. The infected circle was divided into four quarters. Each quarter was placed under a European officer with a native gentleman, a medical subordinate, and one or more disinfecting parties under him. The names of the villages of each quarter were printed on long slips. On receiving the village reports, these slips were filled in and sent to the officer in charge at once, so that each village at all suspicious could be searched within 24 hours, if necessary. On finding a new village to be infected, a list of the inhabitants was prepared by the Village Talati and the whole village emptied within 24 hours. The Village Talati and Havaldar were required to call a roll of the people from the lists, and report any absentees. The result of these measures was to insure a daily report from each village and so obtain earlier information, and to empty the village before it became thoroughly infected; the lists acted as a check on the people leaving the village.

13,129. Then you personally got a report from each village within 24 hours?—Yes.

13,130. Did you at once evacuate every village in which any case of plague occurred?—Yes; or in which there was a report of dead rats.

13,131. When you evacuated villages did the people take their own sick with them?—No, the sick were kept separately in a hut hospital outside the village, and the contacts were kept in a separate segregation camp away from the majority of the people who were living in the fields.

13,132. When you evacuated the villages did you disinfect them?—Yes.

13,133. With perchloride of mercury?—Yes.

13,134. How long after the last case of plague did you keep the people out in camp?—From 21 to 28 days.

13,135. Were any precautions taken before the people were permitted to re-occupy their houses?—Yes; the people were, as a rule, medically examined.

13,136. How many villages were treated in this manner?—Thirty-one villages were immediately evacuated.

13,137. How many villages were totally evacuated altogether?—All except three out of the 54—51.

13,138. Did any fresh outbreak occur in any of those 51 villages after they had been reoccupied?—In five there was a recrudescence of disease.

13,139. What was the nature of it in each instance?—In two of the five villages the villages themselves were found to have been imperfectly cleaned, dirty rags, &c. being found in many of the houses. It is most probable the villagers returned to the infected site. In two villages, though indigenous cases occurred, the first cases were imported.

13,140. What measures did you take when you found they were imported cases?—We partially evacuated the affected block, and thorougly disinfected all the houses.

13,141. Was that effective?—Yes.

13,142. What happened in the fifth village?—In the fifth village the villagers had been having cases among them the whole time, and had concealed them for 21 days without anybody knowing about it, and they were allowed to return with their sick.

13,143. Did you completely evacuate that village?—Yes.

13,144. And also the two villages which were not fully cleaned?—Yes.

13,145. What was the result?—In one village there was rather a bad outbreak while they were in the fields, but there was no further recrudescence after re-occupation.

13,146. How many villages did you evacuate solely because of dead rats being found in them?—Nine.

13,147. Did any cases of plague occur among the people of these villages after they had been evacuated?—In eight of them there were cases of plague.

In the	1st	village	4	cases,	2 deaths.
„	2nd	„	2	„	2 „
„	3rd	„	7	„	6 „
„	4th	„	9	„	2 „
„	5th	„	1	„	1 „
„	6th	„	10	„	9 „
„	7th	„	13	„	8 „

13,148. Did these cases occur immediately after the evacuation, or some time after?—In five villages the cases occurred three days after evacuation. In two villages they occurred 28 or 30 days after evacuation, in one village 7 days, and in the ninth village no case occurred, but we found there was a case about a fortnight before we heard of dead rats.

13,149. Were you able in any other of these nine villages to ascertain whether there had been any cases in the villages before you heard of dead rats?—No.

13,150. Were you able to account for the people in these villages getting affected?—No, except that they had relatives in the surrounding villages.

13,151. After they were removed from their villages could they have communicated with those relatives in

the same way as when they were in the villages?—Yes.

13,152. So that it is not certain they were infected by rats?—No.

13,153. Did you find dead rats in the city of Palanpur at all?—We found a few; not many.

13,154. Did you learn whether there was any history of dead rats in the first epidemic?—No; we could not obtain any history of any marked mortality among rats.

13,155. You found very few?—Very few.

13,156. Are there any monkeys in the neighbourhood of Palanpur?—Yes; a great many.

13,157. Did you see any signs of their being infected at all?—No.

13,158. Or any other animals?—There was a history of dogs being affected in one village, but we could never obtain any of the bodies.

13,159. Could you give us with regard to each village in which plague occurred, a statement which would show the date of the first case, the date you had the information, the date of evacuation, the number of cases before evacuation, the number of cases within the first ten days after evacuation, the number of cases in the first 10 days, and the number of cases after 20 days?—Yes. (The following statement was supplied by the witness.)

STATEMENT showing NAMES of VILLAGES, POPULATION, DATE of the 1st CASE of PLAGUE, EVACUATION, &c.

Name of City or Village.	Population.	Date of 1st Case.	Date of Receipt of Report of 1st Case.	Date of Evacuation.	No. of Cases before Evacuation.	No. of Cases during 1st Ten Days after Evacuation.	No. of Cases during 2nd Ten Days after Evacuation.	No. of Cases occurred 20 Days after to the End of Disease.
			FIRST EPIDEMIC.					
Palanpur - -	21,092	8.2.97	8.2.97	—	—	—	—	—
			SECOND EPIDEMIC.					
Palanpur - -	21,092	2.8.97	2.8.97	2.11.97	604	46	11	13
Chaudisar - -	2,408	30.9.97	29.9.97	15.10.97	13	4	3	26
Malau - -	2,750	2.10.97	1·10.97	3·10·97	2	29	17	13
Rajpur - - -	129	15.10.97	14.10.97	15.10.97 (Partial.)	1	—	—	—
Kanodar - -	3,444	28.10.97	27.10.97	11.11.97	18	17	17	62
Bhagal - - -	544	7.11.97	6.11.97	8.11.97	8	6	1	—
Gathamau - - -	1,615	12.11.97	11.11.97	12.11.97 (Partial.)	1	5	3	—
Kerzoda - - -	687	18.11.97	18.11.97	19.11.97	4	1	—	—
Vedincha - -	1,564	20.11.97	19.11.97	11.1.98	10	—	—	—
Deesa Town - -	3,865	19.11.97	18.11.97	23.11.97	3	4	12	20
Jagana - -	1,909	23.11.97	23.11.97	25.11.97	2	—	9	6
Metta - - -	2,605	25.11.97	24.11.97	17.12.97	31	34	15	13
Gadh - -	2,753	30.11.97	29.11.97	22.1.98	18	2	1	1
Chaugmada - -	1,068	9.12.97	8.12.97	25.12.97	20	10	1	3
Sadapur - -	874	12.12.97	12.12.97	14.12.97	9	9	—	—
Chitrasani - -	914	12.12.97	11.12.97	12.1.98	4	—	—	—
„ (Imported.)		24.2.98	23.2·98	24.2.98 (Partially.)	2	—	—	—
Chadokha -	1,499	16.12.97	16.12.97	19.1.98	10	5	—	1
Ratanpur - -	379	17.12.97	17.12.97	18·12·97	4	—	—	—
Rupal - -	1,077	18.12.97	18.12.97	11.1.98	7	2	1	—
Dangia - - -	719	18.12.97	17.12.97	19·12·97	1	4	2	5
Bhutedi - -	708	19·12.97	18.12.97	27.1.98	1	—	—	—
Wasan - - -	727	22.12.97	22.12.97	15.2.98	6	1	—	—
Hebatpur - -	481	28.12.97	27.12.97	26.12.97 (On suspicion of dead rats.	—	4	3	—
Khemana - -	283	25.12.97	24.12.97	25.12.97	6	8	3	1
Basu - -	2,525	29.12.97	28.12.97	8.1.98	37	3	9	21
Bharkawada - -	633	2.1.98	1.1.98	5.1.98	7	4	1	3
„ (Imported.)		15.4.98	14.4.98	15.4.98 (Partially.)	1	3	—	—
Gadalwadu - -	719	6.1.98	5.1.98	7.1.98	2	—	1	—
Wasda - -	428	14.1.98	13.1.98	15.1.98	5	2	—	—
Magadar* - -	1,753	18.1.98	17.1.98	22.1.98	7	—	—	31
Hoda† - -	639	19.1.98	18.1.98	22.1.98	3	—	—	8
Mahamadpur -	1,824	19.1.98	18.1.98	25.1.98	20	9	7	1
Achedi - - -	280	25.1.98	24.1.98	26.1.98	12	6	1	—
Badarpur, (Bhutedi) -	246	26.1.98	25.1.98	27.1.98	5	5	—	—
Dhauada - -	1,410	27.1.98	26.1.98	31.1.98	8	1	—	8
Khassa - - -	679	28.1.98	27.1.98	29.1.98	6	1	—	—
Khodla - -	307	28·1·98	28.1.98	1.2.98	6	2	1	5
Bhawisana - -	707	3.2.98	3.2.98	4.2.98	1	—	—	—
Kherdosan - -	942	9.2.98	9.2.98	12.2.88	2	15	7	8
Wadanal - -	819	12.2.98	12.2.98	10.2.98	—	3	3	—
Ambetha - -	314	22.2.98	22.2.98	24.2.98	3	—	—	—
Chhatrala - -	85	24.2.98	24.2.98	26.2.98	3	8	3	—
Chuga - - -	1,497	1.3.98	28·2.98	5.3.98	6	4	2	1
Wasani - - -	264	28·2·98	28.2.98	28.2.98	2	—	—	—
Kuskal - - -	700	2.3.98	2.3.98	28.2.98 (On suspicion.)	—	9	1	—
Takarmada - -	1,573	2.3.98	1.3.98	28.2.98 (On suspicion.)	—	9	—	4
Lurma - - -	416	4.3.98	4.3.98	1.2.98 (On suspicion.)	—	—	—	1
Wasaua - - -	416	6.3.98	6.3.98	9.3.98	3	5	—	—
Mahi - - -	1,110	6.3.98	5.3.98	27.2.98 (On suspicion.)	—	4	—	1

* Recrudescence due to infected site.

† Recrudescence due to systematic concealment.

Capt. N Ramier, I.M.S.

26 Jan. 1899.

Name of City or Village.	Population.	Date of 1st Case.	Date of Receipt of Report of 1st Case.	Date of Evacuation.	No of Cases before Evacuation.	No. of Cases during 1st Ten Days after Evacuation.	No. of Cases during 2nd Ten Days after Evacuation.	No. of Cases occurred 20 Days after to the End of Disease.
Mahi (Infected Site.)		24.4.98	23.4.98	24.4.98 Partially.)	2	—	—	—
Saripada - -	400	15.3.98	15.3.98	13.3.98 (On suspicion.)	—	2	—	—
Badarpur - -	307	18.3.98	18.3.98	19.3.98	1	6	1	—
Sherpoora - -	320	23.3.98	23.3.98	26.2.98 (On suspicion.)	—	—	—	4
Piploo - -	585	3.4.98	2.4.98	4.4.98	6	2	—	—
Rajpur Deesa - -	2,443	25.3.98	25.3.98	26.3.98	1	—	—	—
Dantimada - -	1,116	27.9.98	26.9.98	27.9.98	9	16	—	—

STATEMENT showing the NUMBER of CASES and DEATHS according to CASTE, SEX, and AGE, during the two outbreaks of PLAGUE at PALANPUR.

	First Epidemic.		Second Epidemic.	
	Cases.	Deaths.	Cases.	Deaths.
CASTE.				
Number of cases and deaths among Hindus.	133	84	312	206
Number of cases and deaths among Musalmans.	8	6	362	207
	141	90	674	413
SEX.				
Number of cases and deaths among Hindus. Males - 35	20	130	91	
Females 80	52	124	79	
Children 18	12	58	36	
Number of cases and deaths among Musalmans. Males - 5	5	120	72	
Females 1	1	177	106	
Children 2	1	65	29	
	141	90	674	413
AGE.				
Number of cases and deaths in persons between:—				
1 to 10 years - -	13	8	83	42
11 „ 20 „ - - -	38	19	172	103
21 „ 30 „ - -	31	17	155	93
31 „ 40 „ - - -	26	20	122	72
41 „ 50 „ - -	15	13	77	56
51 „ 60 „ - - -	15	10	46	34
61 „ 70 „ - -	2	2	13	8
Over 70 „ - - -	1	1	6	5
	141	90	674	413

13,160. Do you think that the results which have resulted from immediately removing the whole population from an affected village are very strongly in favour of that system?—Yes.

13,161. How long did it take, on an average, to suppress the disease in villages from which you were able to remove the population at once?—About 14 days on an average.

13,162. In some villages did it stop much more rapidly than that?—In some villages it stopped within a few days.

13,163. (*Dr. Ruffer.*) When you evacuated a village and the people were placed in camp, could they communicate with other villages?—We tried our best to prevent them, but they could.

13,164. You had no such thing as a cordon?—No.

13,165. How did you ascertain the number of persons in the evacuation camps?—We had roll-calls every day by the village Patels.

13,166. Did you have any corpse inspection?—In Palanpur nobody could be buried without a certificate from the State doctor. He, or his assistant saw all the bodies.

13,167. I see in one of the villages where you found a previous history of rats having died from plague, the disease appeared 28 or 30 days after the people were placed in camp?—Yes.

13,168. Could that possibly be due to the previous rat infection?—I do not think so.

13,169. How do you think these people got the disease?—I think that those villages were infected by visiting their friends in the neighbouring villages.

13,170. So that in that case you could not trace any relation between the rats and the disease?—No.

13,171. (*Mr. Hewett.*) I think you said that you did not trace it in any case?—That is so.

13,172. (*Dr. Ruffer.*) I gather from your précis of evidence that the population of 22 villages which were partially evacuated is over 36,000?—That is so.

13,173. The villages completely evacuated were 31 in number, and their population over 21,000?—Yes.

13,174. So that the villages completely evacuated were, on the whole, smaller than those partially evacuated?—Yes, but the partially evacuated villages were eventually completely evacuated.

13,175. Does the plague last longer in small or large non-evacuated villages?—It lasts longer in the larger villages, as a rule.

(Witness withdrew.)

Lieut. Niblock, I.M.S.

Lieut. NIBLOCK, I.M.S., re-called and further examined.

13,176. (*Dr. Ruffer.*) I asked you yesterday whether you have been able to trace a pneumonic case to another pneumonic case or to a bubonic case?—Those cases which I have quoted occurred in their own houses. There was a possibility of their getting infection from another quarter.

13,177. Please give us an account of these cases?—I have two. I did not treat any of those cases, but I had their houses opened up, ventilated, and cleaned. The first case was a man named Juma, 55 years old, living in No. 2, Weaver Street, in the Market Quarter. That was a rather badly infected quarter of the town at the time. The date of attack was the 14th February 1897. This man had got consolidation of both lungs extending all over the lower lobe on the right side, and about half that extent on the left. He had got a light rose-pink sputum with all the signs of pneumonia. The temperature reached 104 on the 20th. He had well-marked rales all over the front of the chest, great difficulty of breathing, and pain in the chest. He died on the 21st February. His brother Ahmed lived in the same house. He was 39 years of age, and attended on the first patient. This man was attacked on the 17th February. The lymphatics of his left arm were inflamed from the elbow upwards. He had a large painful bubo in the left axilla and a peculiar diffuse

swelling all round it, and also beneath the clavicle on the same side. His temperature averaged 102·6 and pulse 114. He died on the 22nd February.

13,178. There, apparently, the same source of infection gave rise to a pneumonic and a bubonic case?—I should think so.

13,179. Have you any other similar cases?—There are three cases which occurred in one house in Princes Street in the Jail Quarter. All three were relatives; they were Hindu Lohanas, and had been resident in Karachi over a year. The first person attacked was a male aged 15 years. He was attacked on the 11th February 1897. He had buboes in both groins and also a bubo on the left side of the neck, the first time I saw him. He had also dulness (complete) at the base of the right lung behind, extending up the full length of the lower lobe. In front there were moist rales all over the chest, more marked in right lung. He died on the 22nd February at mid-day. I could not say whether the bubonic or the pneumonic form was primary in this case.

13,180. That was a mixed pneumonic and bubonic case?—Yes. The second case was a male 32 years of age, who was attacked on the 15th February. When I saw him he was semi-comatose and rambling in his speech. He had pneumonia in his left lung—all the typical signs of pneumonia — and rales all over the remaining part of his chest. His temperature went up to 104°; he had a very frequent and weak pulse. He died on the 21st February.

13,181. He had no bubo?—No, this was a pneumonic case. The third case was a female aged 32 years. She lived in the same house and attended on the patients. She was attacked on the 19th February. I first noticed that she had got fever on the 21st, but she refused to allow me to examine her chest. She had got a severe cough and had got a pneumonic sputum with a temperature of 103·8, and a pulse very weak, 113. She died on 23rd February.

13,182. Had she a bubo at all?—No.

13,183. Have you had any experience of compulsory segregation?—In the Malir camp we had a special segregation camp.

13,184. I mean in Karachi? — I had not any personal experience of it in the town of Karachi.

13,185. I understood you to say yesterday that, at the present moment, the houses in which plague cases have occurred are not disinfected?—That is so.

13,186. Since when has that been the case?—This was the case during last week. There was a case which occurred a week before that in the Garden Quarter where the houses were not disinfected. I asked the Superintendent there if he had disinfected, and he said he had not.

13,187. Has that order been cancelled?—Yesterday I got an order stating that the disinfection of the houses themselves should be carried out.

13,188. (*The President.*) A new order?—Yes; there was an order before to that effect, but in these cases which I mentioned in Garden Quarter the houses were not disinfected. A case occurred in the centre of the town last Thursday, where disinfection was not carried out.

13,189. (*Dr. Ruffer.*) Is it your opinion that disinfection is a useful measure?—I believe so.

13,190. Have you any special facts to bring forward on that point?—Of course, it is different in a town, but my experience is in connexion with Malir camp. After disinfection there was never any recurrence of cases, although re-occupation took place a fortnight afterwards.

Lieut. Niblock I.M.S.

26 Jan. 1899.

13,191. Of all the plague measures of which you have had experience which do you consider the most useful?—I think that when a case of plague occurs in a house the most useful measure is to take the sick person to a hospital and take the contacts to a segregation camp where they would be under careful control, and evacuate the block, and, if possible, the community, because the different members of a community here mix very much with one another. At present among the Cutchi Memons, although they do not live exactly together, there is a great deal of intercourse between them, and the disease was brought from one quarter to another in that way. I think the community, as far as possible, should be completely turned out. In order to be successful it should be complete; I do not think the people should be allowed to return to their houses for at least a fortnight after the last case.

13,192. What are the special measures of disinfection which you would adopt?—I should have the floors of houses thoroughly drenched with perchloride of mercury. In the camp I used to throw bucketsful of perchloride of mercury on the infected floors. It is expensive, but it is efficacious. After we had finished, the floors often were a quarter of an inch deep in the perchloride of mercury solution. I do not say that that would be applicable to a town, because expense would bar that, but if possible, I think it is the proper method to follow.

13,193. How would you disinfect the clothes of the patients?—By perchloride of mercury.

13,194. Have you anything to add to what you have already told us about the pneumonia cases you have seen here? — In connexion with the diagnosis of pneumonia last year in the hospital I should like to bring forward one point. A very large number of our cases of pneumonia occurred during the months of March, April, and May. I have found out from the Civil Surgeon and the Staff Surgeon that it is very rare to have any pneumonia at that time of the year, and that there are not generally more than two or three cases a month, and also that the mortality from pneumonia is low here.

13,195. What I wished to be clear about was whether you were certain they were cases of plague pneumonia?—As a matter of fact I thought it was strange that so many recovered, and therefore we were very particular about the diagnosis.

13,196. (*The President.*) Have you got clinical records of the cases which you gave in to-day?—The records are not complete, for the reason that I was not allowed to treat the patients, and therefore I did not take much interest in the matter.

13,197. Have you the temperature and the respiration?—No. I had not time in the house-to-house inspection to make charts.

13,198. Was the sputum of these cases you have just spoken of examined?—We had no means of carrying out bacteriological examinations.

13,199. It was not examined?—No. Some of them are very typical indeed. One was a very light rose-pink.

13,200. Was it rusty?—No, not in this case.

13,201. Can you tell us whether pneumo-coccus was present?—No, I cannot.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Frere Hall, Karachi.

THIRTY-SIXTH DAY.

Friday, 27th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT.
Mr A. CUMINE.

Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Mr. J. SLADEN, I.C.S., re-called and further examined.

Mr. J. Sladen, I.C.S.

27 Jan. 1899.

13,202. (*The President.*) I think you wish to give us further information about what is now being done in Karachi in the houses where plague cases occur?—It is not exactly that. On your record of evidence at present there are two statements—one by myself, as President of the Plague Committee, that disinfection of the infected houses is being done in every case of plague; and another statement by an officer who is serving under the Committee, that it has not been done in every case. I think, if I may be allowed, I would like to reconcile these two statements to some extent. The orders about disinfecting houses are definite and I have already stated them in my evidence, that disinfection has to be done in every house in which a plague case has occurred, or in which dead rats have been found when the people have evacuated it. It has to be done ordinarily by the house owners, under the instructions of the Superintendents, and if they do not do it themselves, then it is done by the Superintendent and charged to them. Those orders were given in September last, and they have never been modified in any way. They were repeated on Saturday last at a public meeting, and the actual fact is, as I stated, that disinfection has been done in every case. That was the information I had received. I had not personally seen the houses, but from further inquiries, on asking Dr. Niblock, it seems that some of the infected houses in the Garden Quarter were not done punctually, that is, they have been done, but they were not done at the time, and one house in the Market Quarter, out of two which were infected, was only partially done under some misapprehension. Those, as far as I understand, are the real facts about these houses.

13,203. The responsibility for having them properly and promptly disinfected lies in the first place on the Superintendent?—Yes, on the Superintendent in whose charge the case has occurred.

13,204. Some mistake has occurred?—Yes; a mistake about the orders has occurred—they had not been properly understood.

13,205. (*Mr. Hewett.*) Can you tell us what the orders were before September when those at present in force were brought into operation?—The orders were practically the same—that the infected houses were to be disinfected. I do not think there were any more definite orders than that.

13,206. Who was to do the disinfection—the landlord or the tenant?—The landlord would be the person we should go to first.

13,207. Have you any means of compelling him to do it?—Yes, simply by our own orders.

13,208. You would do it instead if he did not?—Yes.

13,209. Does that lead to any delay in disinfection?—Not more than a day or two, and if the house is shut up meanwhile we do not consider there is any danger. As regards the second statement, which I did not catch yesterday when I was here, by Lieutenant Niblock to the effect, I understand, that he had just received orders again that disinfection was to be done as before—I hope I am quoting him correctly—as it stands, it is likely to give a wrong impression altogether. These orders, as I say, were merely the orders of September last, which were repeated at a public meeting we had on Saturday, and which were issued in print as soon as possible afterwards. I think they were signed on Monday, and came to Lieutenant Niblock in printed form yesterday morning. No fresh orders have been issued in the matter, and it was simply the Plague Committee resolution which was received by him that morning.

13,210. (*The President.*) Had they been printed previously, or was that the first time they were printed?—The original orders were printed in September.

13,211. Perhaps Dr. Niblock was not here then?—He knew the orders perfectly well, but I think the way the statement was made before you was rather calculated to give a wrong impression upon the subject. It sounded as if orders had just been issued, whereas it was merely a repetition of old orders.

13,212. How long did you allow the people to wait before you took the disinfection of the houses into your own hands?—We have not given any definite time, but the Superintendent would do it within two or three days.

13,213. That has not been done in one or two of the cases we have heard about?—In this particular Garden Quarter—I have not been in Karachi myself, I have been out in the district—but from inquiries I made I thought they were done at once. On farther inquiry I found that they were done since.

13,214. When the inhabitants of the houses themselves do the disinfection, what directions do they get?—Merely verbal instructions from the Superintendent. If they wished it he would supply the disinfectant—perchloride—and they would supply the labour, which would enable them to do it at their own expense, instead of having a bill sent in to them afterwards.

13,215. They would do it, but they would be actually supervised by your official?—It would be supervised by the Superintendent while it was being done.

(Witness withdrew.)

Mr. S. M. KAKA re-called and further examined.

Mr. S. M. Kaka

13,216. (*Mr. Hewett.*) In your first examination I think we omitted to ask you whether the cook, the first ascertained case of plague in the first epidemic, had had any connection with Bombay?—None whatever.

13,217. Can you tell us the arrangement for death registration here under ordinary circumstances?—Under ordinary circumstances the Registration Department is entirely under the charge of the Deputy Sanitary Commissioner of the district.

13,218. Within the Municipal area?—Yes, within the Municipal area.

13,219. Has the Health Officer nothing to do with it?—He has nothing to do with it.

13,220. Do you know what the system is?—Yes. Every death is supposed to be reported to the Registrar within a certain period, I think it is within fourteen days.

13,221. How many registrars are there?—There is the Chief Registrar, and there are a certain number of sub-registrars under him. These sub-registration Karkuns are also vaccinators; they are located in certain districts where the births and deaths are reported, and also where we have vaccinations performed generally.

13,222. Is there a legal obligation upon every head of a family to report a death here?—Yes.

13,223. Is the cause of death reported?—The main heads, such as fever, small-pox, stomach and bowel complaints, accidents, and all other causes.

13,224. What proportion of people in Karachi are attended by medical men with European qualifications?—I should say practically very few.

13,225. So that in most cases the cause of death is only guessed at?—Yes.

13,226. Is it not the fact that many cases are reported as fever which should come under different heads?—Yes, and *vice versâ*.

13,227. I should like you to look at the figures you give with regard to the Khojas. Were the deaths reported by the head of the family in these cases in the ordinary way?—The system at present prevailing with regard to these deaths is quite different from what prevailed under ordinary circumstances.

13,228. Who were these deaths recorded by?—The Plague Superintendents of the districts.

13,229. Did you get them from the Plague Superintendents of the district?—I got them from my registers. Every day the mortality that takes place in the city is sent to my office by the police.

13,230. Separately?—With the death certificates as given by the Medical Officers of the districts, or by private practitioners, or by Plague Superintendents.

13,231. Did you get the figures which you have put in these tables from your registers, or from any other source?—My register is compared with the register which is in the office of the Registrar of births and deaths, and I also make private inquiries.

13,232. You got information by private inquiry?—Yes.

13,233. You had taken a census of these men, I understand, by private inquiry?—Yes, I took the Headman of these Punjabhai Khojas into my confidence. I put a special man of my own in charge. He knows all these houses where the Khojas are, and he went round from house to house and enumerated them. I have a complete record in my office.

13,234. Had all these people who died and are said to have been uninoculated different names from those of the inoculated persons?—Yes.

13,235. Are we to understand that there were no inoculated persons of the same names as the uninoculated persons who were reported to have died?—None. I will give you one explanation. In my table, the deaths you find amongst the uninoculated from other causes may be deaths from plague, and for which I cannot vouch; but they will be always uninoculated. You would not find a single inoculated person registered in this table. It may have been a case of death from plague.

13,236. You get these figures partially from private inquiry; how do you know that the real name of the person who died was always given to you?—You must accept the name given by the person from the house as correct.

13,237. When you get the name from the private inquirer, how do you know that that was the name of the person who actually died?—By comparing with the register.

13,238. You did compare it with the register?—Yes.

13,239. Do you think it was ever possible that an inoculated person who died was represented to you as an uninoculated person who had died?—I do not think so.

13,240. These figures are very astounding. Can you give any explanation of them?—I have taken out the figures up to the week ending 21st January. There were no deaths among the inoculated or uninoculated in the month of October, none whatever. There were none during the first two weeks of November, and up to the 21st of this month, there were only two deaths amongst the inoculated, and eight amongst the uninoculated. I have the figures subsequent to the 30th of September. (*Vide* table inserted in answer to Question No. 11,780.)

13,241. I suppose you realize that the death-rate given for these uninoculated persons for the six months from April to September 1898 corresponds to a death-rate of 220 per thousand in the year?—Yes, a little over 200.

13,242. Are they people who are, generally speaking, rather better off than the ordinary run of people in Karachi?—They are.

13,243. Would not a death-rate of 220 per mille during the year be rather an astounding rate of mortality among persons so circumstanced?—If they are all deaths from other causes, except plague.

13,244. Assuming that the deaths recorded as having been due to "other causes" did include deaths from plague, is it not rather extraordinary that the mortality among the children under five years of age during that period would work out to a death-rate of 49·5 per cent. in the year?—It is wholly unaccounted for. I cannot give any explanation of that.

13,245. How do you account for a mortality of 26 out of 106 of their children in six months?—I do not know whether you know that these deaths are not included in the calculations. These are deaths from other causes which are not included in the population of the Khojas. You will notice in the Report* I have mentioned that the deaths from other causes are not included in the total population; that is to say, if you want to calculate this 26 with the 106, you must add to the 106 the 26.

13,246. That will not make a very material difference. I think you might ignore that altogether?—Yes.

13,247. How do you account for a mortality of 49·5 per cent. per annum among the uninoculated Khojas under five years of age?—I assume that the mortality is always higher among children under five years of age.

13,248. But then you have these 168 inoculated children under five years of age who have escaped death entirely for six months?—That is a point, so they have. I cannot give you an explanation of that.

13,249. Do you conceive it possible that these figures are right?—I think so. I can only say that, as regards the inoculated, there is not a single death except the two that occurred in the month of December. As regards the uninoculated, you may have deaths here which may have been due to plague and may have been entered under "other causes."

13,250. To what extent are you likely to find plague among children under five years of age?—Between one and five you ought to find plague.

13,251. To what extent?—The total mortality per thousand from plague is 12·14 in the first outbreak.

13,252. You might look at your table showing the gross mortality in Karachi during the second outbreak (*see* answer to Question 11,735), as the period for which they are given corresponds with that for which you have given particulars now, regarding the Punjabhai Khojas. What was the total mortality from plague among children under five years of age during that period?—67.

13,253. What death-rate per mille of the total estimated population of that age does that mortality represent during the year?—Five per 1,000.

13,254. That is somewhat different from 49 per cent.?—Yes, it is.

13,255. Have you calculated the ratio that the total mortality from all causes, as put down here among the uninoculated, would give among the inoculated and uninoculated combined?—I have not worked that out as all.

* *See* Appendix No. XL. in this Volume.

Mr. S. M. Kaka.
27 Jan. 1899.

13,256. It comes to about 40 per mille. Would not that be very near the normal rate of mortality among the general population?—Yes, that would be so.

13,257. Have you ever seen a case in which a person has had plague twice?—I do not remember now. (Note added by witness on correcting proof of his statement:—Since giving evidence I have come to learn of a case in which a person had plague here. One Gulam Mahomed Validad, a Muhammadan Punjabi, aged 32 years, a mounted police constable by occupation, was attacked with plague on 4th June 1898, had bubo in left axilla, and was discharged cured from the Civil Hospital on 10th July 1898. The same man was again attacked on 29th January 1899, and is now under treatment in the Civil Hospital.)

13,258. (*Dr. Ruffer.*) Did you ascertain the causes of death of the Khojas who died from other causes than plague?—I got them from the notification certificate.

13,259. There was no corpse inspection in their case?—No, not necessarily.

13,260. Do you think it is possible that some of them might have died from plague?—They might have died from plague, but they were uninoculated even if they did die from plague.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Frere Hall, Karachi.

THIRTY-SEVENTH DAY.

Saturday, 28th January 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. J. P. HEWETT. | Dr. M. A. RUFFER.
Mr. A. CUMINE.

Mr. C. J. HALLIFAX (*Secretary*).

Dr. V. E. Nazareth.
28 Jan. 1899.

Dr. V. E. NAZARETH called and examined.

13,261. (*The President.*) You are Licentiate of the College of Physicians and Surgeons of Edinburgh, and Doctor of Medicine of Brussels?—Yes.

13,262. And you are Medical Officer in charge of the Seth Vishandas Hospital in Karachi?—Yes.

13,263. You have had opportunities of observing the effects in the treatment of plague of Professor Roux's serum, prepared in Paris?—Yes.

13,264. How is this anti-toxin prepared?—I cannot tell you.

13,265. You have not the details?—No. I can only witness to the effect of the serum as tried in the hospital. These experiments with the serum were conducted by Dr. Simond in person.

13,266. The administration was superintended by him?—Yes.

13,267. Where was the serum obtained?—It came from the Pasteur Institute, Paris, about 50 to 100 bottles weekly. We got a supply by every mail.

13,268. Did you continue the observations throughout the whole of the epidemics?—No. When Dr. Simond left he only left a few bottles of serum, and I did not think it worth while to continue the experiments without having sufficient material.

13,269. You had not a sufficiently large supply to apply it properly?—That is so.

13,270. Can you tell us anything about the probability of obtaining a supply now?—Yes. Dr. Simond informed me six months afterwards they would be able to supply a large quantity of serum and of a better quality.

13,271. When were your observations commenced?—The 9th May.

13,272. How many plague patients had been admitted into the hospital?—288, up to the time the serum treatment was effected.

13,273. What was the mortality?—202, giving a percentage of mortality of 70·14.

13,274. Between what dates did the treatment with this serum extend?—Between the 9th May and the 6th June.

13,275. In that period what was the number of plague cases which were treated?—122, with 78 deaths, giving a percentage of 63·9.

13,276. How many of these cases were treated with the serum?—47.

13,277. What was the result of the treatment?—25 recovered, showing a mortality of 46·8 per cent.

13,278. Subsequently to that time, had you any further cases?—38 cases, with a mortality of 21, which represents a percentage of 55·3.

13,279. What was the total number of cases which you treated with the serum?—47.

13,280. Were these cases selected on any plan?—Purely on the fact of their being recent.

13,281. All recent cases?—As recent as we could get.

13,282. You did not exclude any cases?—No.

13,283. You included those which were severely affected also?—Yes.

13,284. There was no limitation as to age?—No.

13,285. Would you be good enough to give us some particulars of individual cases treated with this serum?—The case No. 296 was the first case. She was done at the urgent request of her relatives.

13,286. What age was this woman?—40.

13,287. How long had she been ill at the time of treatment?—She was two days in hospital, but everyone admitted in the hospital stated that they were recently infected: they never admitted that they had been infected longer than one day for fear of prosecution by the authorities.

13,288. Was she very ill?—Yes.

13,289. What was her temperature before treatment?—I do not remember the temperature, and have, unfortunately, no record of it.

13,290. What glands were affected?—The glands of the left groin.

13,291. How much serum did you inject?—40 c.c. was the first dose, and the same amount for the second

dose given 12 hours afterwards. Her condition improved, the pain in the bubo subsided, and she was to all appearance quite well.

13,292. Did she recover?—She died rather suddenly, the third day after, from syncope while sitting up in bed, contrary to the instructions given.

13,293. What was the next case?—Her daughter (Case No 297), was moribund, but at the request of her relatives she was injected. She died the same evening before the second injection was attempted.

13,294. These cases do not show anything?—No; but they show that cases other than apparently mild and favourable cases were experimented upon: they also show the rapidity of effect as evidenced in Case No. 296.

13,295. Have you any more satisfactory cases?—Yes.

13,296. Will you give an account of them?—Vatoo Chuttoo (Case No. 307), a recently infected case, was admitted on the 11th May. Temperature on admission was 103·4° F. at 8 a.m.; 40 c.c. of serum was injected at about 10.30 a.m.; the temperature at 12 noon was 104° F., and at 4 p.m. 102° F., the pain in the bubo being slightly relieved. Next morning the temperature was 103° in the morning, and 103·2° at 4 p.m., the injection having been repeated in the morning. A third injection was given in the evening, and next morning, the 13th, the temperature fell to 100° F. On the 14th the temperature was normal in the morning, 100° F. in the evening, after which date he made an uninterrupted recovery and was practically cured; the pain in the bubo disappeared, the bubo subsided, and no further treatment was adopted. The man was fit to be discharged on the fifth day after admission, but for reasons of safety he was discharged five days later, *i.e.*, he was fit to walk to the Civil Hospital for examination and detention in the convalescent ward there, a distance of about 300 yards.

Case No. 309 was a very severe case. Temperature on the morning of the 11th was 104·4° F.; an injection of 40 c.c. of serum was administered, temperature in the evening 104·6 F., re-injected with the same dose of serum; temperature on the 12th, 102·2° F., in the evening, temperature 105·2° F., was injected a third time next morning, *i.e.*, on the 13th May, the temperature was 101·6° F., and the local and general condition improved; the temperature gradually fell, though the patient remained in a low condition for a considerable period, and the gland which had almost subsided became again painful, and ultimately suppurated. In this case I attribute the final cure to careful nursing and stimulation of the patient.

Case No. 318.—On admission the temperature was 104·4° F.; after two injections it fell on the 14th to 99° F., and was perfectly normal on the 15th; he made an uninterrupted recovery subsequently, and was practically cured in three days.

Case No. 323.—The effect of the serum treatment in this case also was remarkable. On admission the temperature was 103·6°; the woman was unconscious, almost moribund; she improved after the first injection, and was cured after the second; the pain in the bubo disappeared, and the temperature was normal on on the 17th.

Cases Nos. 337 and 338.—Father and son. These two cases were very remarkable, as evidencing the rapid effect of the serum treatment. They arrived on the evening of the 18th; the father, who was conscious, would not permit any treatment, the son, No. 338, being unconscious, was, at my request, injected with serum; his temperature then was 103·4° F. It fell to 100·4° F. next day, and after the second injection he sat up in bed apparently quite well. His temperature fell to 99° on the 22nd, and he was practically perfectly cured. His father, No. 337, in the meantime gradually grew worse, and on the evening of the 22nd was almost moribund; although it was too late to inject him, his son's earnest pleadings persuaded Dr. Simond to inject him the same evening; the improvement next morning was so marked, that a second injection was tried, when the patient was declared out of danger.

Cases 354, 355, 357, 358, 361, 362, 363, and 371, sawyers by caste, and otherwise related to each other, came to hospital between the 22nd and 25th May 1898. Two were attendants on their relatives, the others were sent from the segregation camp. In all these cases (not including Cases Nos. 354 and 355, who were moribund when admitted), the disease had just appeared, and the same treatment was adopted early. A recovery of six out of eight is very encouraging. No. 354 and 355 were apparently hopeless cases. No. 355 never rallied, but No. 354 improved after the third injection, and ultimately recovered.

Cases Nos. 349 and 351 developed plague in hospital. No. 351 must have been previously infected, and had come to hospital with her mother, who was an attendant on her other daughter, No. 350. This little patient, aged four years, was also injected and made a remarkably rapid cure, being practically quite well in two days. She waited in hospital after recovery, until her sister also recovered.

Case No. 349 developed plague in hospital, being the first case of infection there. His was a severe case, having a bubo on the right side of the neck. Here also the effects of the serum treatment was noticeable.

13,297. (*Dr. Ruffer.*) Will you kindly give a short clinical synopsis of each case, noticing especially the effect of the injection on the temperature and on the bubo?—Yes, I will, if possible, forward it later. *

13,298. (*The President.*) What is the standard dose of this serum?—40 c.c.

13,299. How often was that dose repeated?—The second dose would usually be repeated after 12 hours, and a third one, if the symptoms did not improve, 12 hours afterwards. If there was an improvement a third dose was not given, but if the symptoms were again aggravated, as occurred in a few cases, an injection would be tried after a lapse of one, two, or three days.

13,300. Was there ever a fourth dose injected?—In one case, I believe. It is very seldom given.

13,301. Some cases in which three doses had been given died, I understand?—Yes, generally cases which developed pneumonia.

13,302. Why did you not give a fourth dose in those cases?—Because we found that three doses given rapidly after one another had no effect on them.

13,303. Did you try the serum frequently in pneumonic cases?—Yes.

13,304. Did it invariably fail?—We tried it in about seven cases, and declined to try it any more.

13,305. Did you invariably fail in pneumonic cases, so far as you tried it?—With the exception of one case, No. 395 recovered, otherwise they failed.

13,306. With regard to the dose, did you modify it according to the stage of the illness?—No.

13,307. You followed a fixed routine?—Yes.

13,308. You did give three doses in some cases?—Yes.

13,309. And some of the cases recovered?—Yes, many.

13,310. Then in those cases which did not sufficiently improve after the third dose why did you not give a fourth dose?—Because it was considered ineffectual. There was too great a concentration of poison, as Dr. Simond said.

13,311. It was thought hopeless to go on any further with the treatment?—Yes.

13,312. Did you observe any local effects?—At first, within 12 hours, the inflammation or irritation would subside—the irritation at the seat of the puncture.

13,313. There was irritation produced in the first place?—For the first few hours a very slight irritation, just the irritation of the puncture.

13,314. What did you see that led you to suppose that there was irritation?—The patient complained of a little pain there.

13,315. There was no obvious appearance?—No.

13,316. There was no redness?—No.

13,317. Was there any swelling?—There was a swelling according to the amount of serum injected, but that subsided within 12 hours, at the time we were ready for another injection.

13,318. What were the more marked therapeutic effects of the injection?—A fall in the temperature and an improvement in the pulse and tongue.

13,319. What do you mean by improvement in the pulse?—I mean that on arrival the pulse would be small and quick, and afterwards the pulse would be less rapid and larger, and the tongue, which would, in some cases, be dry and brown, would become moist,

* *See* Appendix No. XLII. in this Volume, in which is also published a letter from Dr. Simond to the Secretary to the Surgeon-General with the Government of Bombay, dated 17th June 1898, regarding the cases of plague treated by him with Roux' serum at Karachi.

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and the semi-conscious condition of the patient would improve.

13,320. Will you put in a table of the cases which you have treated?—Yes. It is as follows:—

CASES TREATED in SETH VISHANDAS' HOSPITAL by the CURATIVE SERUM of Professor ROUX of the PASTEUR INSTITUTE, PARIS.

Serial Number from Register.	Name.	Age.	Caste.	Date of Admission.	Date of Death.	Date of Recovery.	Glands affected.	Effect on Glands.	Number of Days in Hospital.	Remarks.
				1898.	1898.	1898.				
296	Koondanbai Thakoordas.	40	Lohana	9th May	13th May	—	Left groin	—	5	
297	Jessibai Thakurdass	10	„	„	11th May	—	„	—	3	
307	Vattoo Chattoo	30	Nussarpuri	11th May	—	20th May	„	Subsided	10	
308	Rutoo Ooger	42	„	„	13th May	—	Right groin	—	3	
309	Prittibai Isser	25	„	„	—	17th June	Left groin	Suppurated	38	
317	Chela Hemoo	17	„	12th May	—	2nd June	„	Subsided	22	
318	Daman Taracband	8	Punjabi	13th May	—	20th May	Right armpit.	„	8	
322	Manbai Jethanand	50	Brahman	14th May	18th May	—	No bubo	—	5	
323	Pritibai Issar	17	Nussarpuri	„	—	20th May	Left groin	Subsided	7	
325	Lukoo Hemon	35	Brahman	16th May	18th May	—	„	—	3	
326	Peara Mukunchand	22	Banniah	„	16th May	—	No bubo	—	1	
336	Bussa Rupoo	35	„	18th May	23rd May	—	Right groin	—	6	Developed pneumonia.
337	Koondan Hottoo	43	Nussarpuri	„	—	29th May	„	Subsided	12	
338	Keemat Koondan	10	„	„	—	„	Both groins	„	12	
340	Dunnoo Namori	10	Megwar	19th May	—	27th May	Right groin	„	9	Rapid recovery
349	Muggun Vishna	40	Nussarpuri	21st May	—	9th June	Right neck	„	20	
350	Jeewabai Lalloo	12	Ahir	„	—	20th June	Right groin	Suppurated	31	
351	Manubai Lalloo	4	„	„	—	10th June	Left arm-pit	Subsided	21	
354	Mugoobai Soojun	30	Koonbi	22nd May	—	9th June	Both groins	„	19	
355	Lukmibai Lalljee	32	„	„	24th May	—	„	—	3	
356	Nanchand Nuthoo	22	Banniah	„	28th May	—	Right groin	—	7	Improved at first, but developed pneumonia on the third day.
357	Laljee Pancha	32	Koonbi	„	29th May	—	„	—	8	
358	Kheta Pacha	38	„	„	—	13th June	Left groin	Suppurated	23	
359	Pritum Dalla	40	Lohana	23rd May	25th May	—	Right groin	—	3	
361	Seogan Manda	25	Koonbi	„	—	27th June	Right groin	Suppurated	36	
362	Maojee Runchore	30	„	„	—	8th July	„	„	47	
363	Kutchra Narayen	16	„	24th May	—	20th June	Right armpit.	„	28	
364	Dhuramdass Sobhraj	39	Lohana	„	—	17th June	Right groin	Subsided	25	
366	Dhallo Saman	31	„	„	—	27th May	„	„	—	Committed suicide on the 27th May.
367	Mooloo Tukoo	44	Nussarpuri	„	—	29th June	„	„	37	
368	Muggan Huroo	16	„	„	27th May	—	„	—	4	
371	Kumkoobai Mowjee	32	Koonbi	25th May	—	9th June	Left groin	Subsided	16	
381	Hassan Ailana	50	Muhammadan.	28th May	29th May	—	No bubo	—	2	Developed pneumonia.
382	Mahomed Hassan	30	„	29th May	„	—	„	—	1	„ „
383	Prema Kanaya	22	Kahar	„	—	17th June	Right armpit.	Subsided	20	
387	Gulalibai Vishna	10	Bhil	30th May	—	„	Left groin	„	19	
390	Subharam Thaooram	29	Khatri	1st June	3rd June	—	„	—	3	
391	Vigibai Daya	5	Sunar	„	—	20th June	Right side	Suppurated	20	
392	Pamanmall Shamdass	9	Lohana	„	—	8th July	Right neck	„	38	
394	Budai Seodin	25	Koonbi	2nd June	3rd June	—	Left groin	—	2	„ „
395	Oomer Ebrahim	18	Muhammadan.	„	—	17th July	Right groin	Suppurated	46	
397	Kanianat Kulloo	36	„	3rd June	5th June	—	Right armpit.	—	3	
398	Krishna Vithoo	26	Mahratta	„	7th June	—	Left groin	—	5	
399	Mugabai Tatia	7	„	„	5th June	—	Right groin	—	3	
401	Dayobai Jeyram	6	Lohar	4th June	4th June	—	Right neck	—	1	
403	Budhoosing Narayansing.	30	Thakur	5th June	10th June	—	Right groin	—	6	
404	Atmaram Daji	31	Mahratta	„	8th June	—	„	—	4	„ „
409	Liberata D'Souza	12	Christian	6th June	—	8th July	Left arm-pit subsided. New buboes on both groins.	All buboes subsided.	33	

13,321. What is your general impression of the therapeutic value of this serum?—That it is effective.

13,322. On what grounds do you form that opinion?—On the rapid effect as witnessed in many cases.

13,323. Whether they recovered or did not recover?—Yes.

13,324. The effects which you have already stated?—Yes.

13,325. Do you think the case mortality was influenced favourably?—The mortality in my hospital was influenced favourably by the advent of Dr. Simond.

13,326. Do you mean by the administration of the serum?—Yes.

13,327. In these cases only do you mean? I am not talking of the general mortality?—In these cases only.

13,328. You have given us a percentage of mortality which seems to indicate that?—Yes.

13,329. (*Dr. Ruffer.*) Did you ever try intravenous injections of serum?—No.

13,330. Did you ever get abscesses at the point of inoculation?—No.

13,331. Did you ever get joint-pains after inoculation?—Yes.

13,332. Perhaps you will add particulars of those cases?—Yes. Cases 337, 338, 349, 364, 392, 409. Joint-pains developed in all of these cases. The knee joints were principally affected. I did not notice any swelling of the joints in these cases, and the pains generally subsided in from four to six days. Where the serum was ineffective joint-pains were not complained of.

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13,333. Were these joint-pains very severe?—Yes, sufficiently severe for the patient to draw our attention to them and ask for remedies.

13,334. Did you ever see them so severe that the patient could not bear to be touched?—Yes; they were not so severe as in an acute case of rheumatism, but sufficient to prevent them moving about in bed.

13,335. Did you ever get abscesses in the joints?—Never.

13,336. Did you ever try the effect on a plague patient of sub-cutaneous injection of warm salt solution?—No.

13,337. (*The President.*) You came to the conclusion, late in your observations, that it was advisable to supplement the serum administration by other treatment?—Yes. In those cases which eventually suppurated I had to supplement the treatment with stimulating remedies.

13,338. Only in those cases where the glands had suppurated?—Yes.

(Witness withdrew.)

(Adjourned till Monday, January 30th, at Cutch Mandvi.)

At The Political Agent's Bungalow, Cutch.

THIRTY-EIGHTH DAY.

Monday, 30th January 1899.

LIBRARY OF THE BOMBAY BRANCH OF THE ROYAL ASIATIC SOCIETY.

PRESENT:

MR. J. P. HEWETT (in the Chair.)

MR. A. CUMINE. | DR. M. A. RUFFER.

M. C. J. HALLIFAX (*Secretary*).

Major G. E. HYDE-CATES, I.S.C., called and examined.

Major G. E Hyde-Cates, I.S.C.

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13,339. (*The Chairman.*) You are Political Agent at Cutch, are you not?—Yes.

13,340. Can you tell us what the rainfall is here?—The average is about 15 to 20 inches.

13,341. Can you give us the ordinary population of the town of Cutch Mandvi?—About 38,000, according to the last census.

13,342. During the winter of 1896–1897 was the population here at all increased?—Yes, after the plague commenced at Bombay, the people came here in great numbers, beginning from January 1897.

13,343. Can you give us an approximate estimate of the population of the town at that time?—One week we had about 5,000 passengers arriving from Bombay and Karachi. That would be about March or April. After the plague broke out in Karachi we had them coming from Karachi as well as from Bombay. The exodus from Karachi to Mandvi began early in March.

13,344. Had you measures to examine them before they arrived here?—Yes, but there was no regular quarantine camp. The following arrangements were made by the Darbar, which I went down to see about the end of October 1897:—

(*a*) Inspection of passengers arriving at Mandvi, Khari Rohar, Mundra, and other ports;
(*b*) Segregation and treatment in separate sheds of all those found infected;
(*c*) Further examination at certain chaukis, two miles outside Bhuj, on all the roads;
(*d*) Detention and segregation for 10 days outside all the villages.

The arrangement at Mandvi was this, that they were examined, and then were sent on to wherever they were going—to their villages—and orders were issued to make them camp outside the village for 10 days, but the probability is that this was not properly carried out, because they had had no experience of plague then, and there is no doubt that many or these people got into the villages, and were not kept outside at all. Of course the majority of persons came to Mandvi, but a good many of them also went into the districts. During October, November, December, 1896, there was quarantine at Mandvi, but when the people began to arrive in such large numbers during the first epidemic in Bombay, the Darbar found a difficulty in arranging for them, and they were, therefore, allowed to go on to their villages after examination, and were supposed to be detained outside for 10 days. The quarantine arrangements, started in September, 1897, were, I think, very useful. The steamers start running after the monsoon. Since then, though there have been many imported cases, they have all occurred in the observation camps, and we have not been able to trace a single case from Bombay, or other infected area, as having occurred outside. The people coming into Cutch by the land route *viâ* Khari Rohar, had to do 10 days' quarantine at Wadhwan, and those who had not passed through Wadhwan did 10 days at Khari Rohar, but very few of these latter came from infected areas probably. There were no imported cases in the camp at Khari Rohar.

13,345. What do you think the maximum population you had in Mandvi itself during that time was?—I should say about May, after they had been coming from Bombay for some time, it rose to about 60,000.

13,346. Does that include Salaya, on this side of the river?—There may have been a few from Karachi going to Salaya, but the majority were for Mandvi itself.

13,347. What is the population of Salaya?—Roughly about 5,000. Of course, at times there are a good many away during the trading season. Many of these

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men go to Madagascar and other places on the African Coast and up the Persian Gulf. They own boats, and during about 6 months in the year are absent from Salaya. But, roughly, 5,000 is about the population.

13,348. Salaya is a hamlet on this side of the river, and Mandvi is a walled town on the other side of the river?—Yes.

13,349. Have you anything special to state about the house accommodation within the walled town; and also about the sanitary arrangements within it?—It is very much congested. The streets are exceedingly narrow, many of the houses are three stories high, and it is generally overcrowded.

13,350. Even with its ordinary population?—Yes, I think it is overcrowded.

13,351. What are the sanitary arrangements?—There is a Municipality, but it is a very weak one. The staff is not sufficient in ordinary times, though lately, since the outbreak of plague, it has been strengthened. Owing to there being so many Mahajans in the place, the streets are made use of for purposes of nature, the Mahajans having a particular dislike to using the latrines. Then the women and children are allowed to make use of the streets, as it is some way for them to go from the middle of the town outside. When we first came down here—in the first epidemic—about April, 1897—the streets were in a most filthy state—in fact, the whole place was nothing but a huge latrine. This has been remedied to a considerable extent. The men are fined if they make use of the streets, and the women and children have to go outside in the day. Latrines have been erected outside the walls, and numerous gateways made in the walls to afford easy egress, and movable latrines are to be put up inside the town in the open spaces. The town is now much cleaner than it used to be.

13,352. There was, at that time, no attempt at conservancy?—None at all to speak of.

13,353. Is there anything peculiar about the houses in Mandvi itself?—They are in what we call delis—that is a sort of courtyard with houses round three sides of it. Some of these delis, or courtyards, contain from three or four up to 15 or 20 or 30 houses in one deli. Large ones have perhaps 30 houses inside this courtyard. They have one common door leading on to the street. Another thing is that the people keep a great many cattle in the town inside their houses, not only in the delis, but actually inside the lower rooms of their houses.

13,354. How many cattle are kept in this way?—We cleared out about 1,000 belonging to the gaulies, but nearly every Banniah, or anybody that can afford it at all, keeps a cow. I should say there must be quite 2,000 to 3,000 cows in the town now. The place is swarming with dogs. Mahajans and Jains will not kill anything at all. They will not kill rats or any animal or insect life, so we had great difficulty in putting the town into anything like a sanitary state.

13,355. Is there anything particular about the houses in the hamlet of Salaya?—The houses are exceptionally dark. There are no windows at all except in the outer room, and there are three or four rooms behind that which are, as a rule, pitch dark, with no windows or ventilation of any sort, except from the door of the front room, which opens on to the street.

13,356. You can probably tell us from historical sources whether the State of Cutch has been subject to plague before 1897?—Yes, in 1812 and 1815. "Towards the "close of the year 1812 Cutch was visited by an out- "break of pestilence of such virulence that it is said to "have destroyed half the people of the country. In "the year 1815, the year of the heaviest known rain- "fall, it again broke out with great virulence at "Kanthkote, in East Cutch or Wagad"—the symptoms at that time were the same as those which have manifested themselves during the present outbreak in this Province—"and very few recovered" . . . . "most died between the third and ninth day" (as is the case in most cases now). "The plague apparently "was in the air, for there was nothing to show that it "was brought from outside, or was spread by the "touch. It appeared to attack most fiercely the "sluggish and vegetable eaters. Rajputs escaped, "while Brahmans and Banniahs died in numbers. "From Kanthkote the disease spread to other parts of "Wagad, causing much loss of life in the early months "of 1816. In May it crossed to Morvi, and came back "in August within 10 miles of Bhuj (the capital), and "at the same time raged in Radhanpur and Sind. "Since 1817 there has been no return of the pesti- "lence." It may be noted that the plague apparently did not get into the town of Bhuj.

13,357. Had you a severe form of fever in recent years, and was there any reason to suppose that it was plague?—In 1878 there was a bad type of fever and it has been suggested that it might have been plague. I think this idea is fallacious, although the fever was undoubtedly unusual and very virulent. Out of about 100,000 persons attacked, 12,344 died, whereas the mortality in plague would have been at least 60 per cent., probably much more. I put in a copy of the report on record.*

13,358. Can you tell us when the first cases of plague were imported into Cutch?—About the 3rd October 1896.

13,359. When did you begin to have cases in Mandvi?—In October. The first imported cases in Cutch occurred early in October 1896.

13,360. From October to February you had a number of imported cases?—Yes, from the 3rd October 1896 to the 28th February 1897 we had 47 imported cases and 25 deaths.

13,361. It did not take hold of the town then?—Not till about the middle of March, as far as I know.

13,362. When did you get your first indigenous cases?—The first indigenous cases occurred at Rawapur in February 1897. They came from Karachi. These have always been considered as the first indigenous cases, though in September 1897 the Diwan informed me, at the time I was writing my annual report, that there had been an indigenous case at Mandvi, on the 4th January 1897, though previously the first indigenous case at Mandvi had been reported as having occurred on the 18th March 1897. Bayeth and Durgapur are supposed to have had one and three indigenous cases, on the 5th and 17th January 1897 respectively. These cases were included in a supplementary return received some time after the Rawapur cases. Bayeth had no further cases till September, and Durgapur not till November, and as they are close to Mandvi, the chances are that they were imported cases from Bombay and not indigenous.

13,363. How far is Rawapur from Mandvi?—Over 60 miles.

13,364. Could you give us an account of the outbreak at Rawapur?—At the latter end of January 1897 three tailors of the same family came to Rawapur from Karachi. They came, not through Mandvi, but overland *viâ* Lakhpat, on the borders of Sind, about 27 miles from Rawapur. The three men were in good health when they arrived, but about 15 days after their arrival one of them was attacked by fever and died on the 11th February 1897. On the 13th a member of the family died, on the 14th one more of the three tailors and three members of the family. The remaining members of the family were separated and taken away from the village, and the houses they had occupied were limewashed and disinfected and locked up, and also some of the houses adjoining. This did not do any good to the family, for on the 20th three, on the 21st two, on the 24th one, on the 27th one, and on the 4th March two more of the family died. The third tailor who had come from Karachi escaped, and there were no other cases in the village. This is the only village so far north which has had indigenous cases, and it is far from any of the villages which were subsequently infected. The total number of cases in the village amounted to 15, with 15 deaths.

13,365. When did you next get any indigenous cases?—We got them at Mandvi itself about the 18th March, and there were cases about the same time at the village of Muska, 1½ miles from Mandvi. The cases at Rawapur did not apparently infect any other place.

13,366. Did you ascertain how Mandvi became infected?—It is presumed to have been infected by people from Karachi. A lot of very low caste (Meghwals) and poor people, supposed to have been turned out of Karachi, came from Karachi during the first week in March, and it was traced to them, as, between the 11th and 17th March 1897, there were 11 cases of plague amongst these people. I do not think it is conclusively traced to Karachi, but there is no doubt that it came either from Bombay or Karachi. Indigenous cases occurred immediately after people came from Karachi, while we had several imported

* *See* Appendix No. XLIV. in this Volume.

cases from Bombay without, apparently, indigenous cases. As soon after a lot of low caste dirty people came from Karachi, the disease broke out in Mandvi, the Darbar put it down to Karachi. Dr. Wilkins thinks* that it was introduced into Mandvi by a passenger from Karachi, an inhabitant of the village of Muska, 1½ miles from Mandvi. This woman and her child, after coming from Karachi, were attacked in the segregation camp near Muska with plague, and the symptoms described pointed to the pneumonic type. The woman was attended by her sister from the village of Muska, and on the former's death the latter returned to the village, where she got plague and died, and infected 10 others who were members of the same family. Dr. Wilkins thinks that this was the beginning of the disease in Mandvi, but he was not here at the time, and can only assume this from what he has been told. There is not the least doubt that Rawapur was infected from Karachi, and Mandvi may also have been infected by the people from Karachi, where I believe the type of plague was very bad at first, and it was dreadfully virulent at the commencement in Mandvi. The returns of cases sent in by the Darbar between October 1896 and the end of April 1897, when plague operations were properly started, were very unreliable.

13,367. When did the infection attack the town of Mandvi?—It is very uncertain, but it was probably about the middle of March.

13,368. Was that when you received the report?—No, I heard first of cases occurring to any extent on the 10th April, though there had been a few cases in March. From the 18th to the 31st March there was a total of 11 cases and six deaths. From April 4th to the 9th there were 13 indigenous cases. I then got a report about this, and came down to Mandvi on the 12th April, and that day there were 23 cases. I wired to the Government, and eventually Dr. Lowson came here at the end of April, and Dr. Wilkins came at the beginning of May.

13,369. At the time you came here I suppose no hospitals had been started, and no measures taken?—No: only measures for examining the people who were arriving here.

13,370. When plague broke out in this way, did any considerable number of people leave the town?—Not till the end of April. They began leaving then when their deaths were becoming greater every day.

13,371. By the end of April had hospitals been started and measures taken to segregate the people?—Yes. As soon as Dr. Lowson came down here (23rd April) we started hospitals at once.

13,372. Did you find any great difficulties in ascertaining whether cases of plague had occurred or not?—Yes, we had that year. Of course searching parties were put on at once, but until we got things shipshape, there is no doubt that there were a great many cases unreported. Of course, previous to the end of April nobody was kept on the gates, or on the burning or burial grounds to take a note of the burnings and burials.

13,373. The burning and burial grounds are outside the town?—Yes. One is below the bridge over the river, and the other is outside the town on the seashore. There is a Muhammadan burial ground just outside one of the gates of the town, which has now been closed. There is also one out here on the other side of this village Salaya. There is also another burial ground near the seashore out in the open.

13,374. When the bodies were being brought to the city gates to be taken outside and buried or burnt, did you endeavour to ascertain whether the cause of death had been plague or not?—Nothing was done that year, simply a note was taken of the deaths, and every death treated as plague.

13,375. When a note had been taken of a particular death, did you make further inquiries to ascertain whether that person had died of plague?—At that time we could not; there was so much to be done. We practically assumed that every case was plague; we knew what the ordinary mortality was, and we found out as they passed through the gates where the body came from, and then the people of that house were segregated, if they had not already bolted. In addition, we had search parties towards the end of April, when Drs Wilkins and Lowson were here, and a good many of course were found in the houses by the search parties, and dead bodies were found in the houses also. We found two in one room, and another in a box, and so on.

13,376. Whenever a dead body was found or a death had occurred, you treated the people living in the house as if plague had occurred in it?—Yes.

13,377. You turned them out of the town?—Yes, and segregated them in a way. With regard to this, I must explain that the arrangements for segregation during the early months of the epidemic of 1897 were not the same as were afterwards adopted. The people were dying in large numbers, and the whole city was panic stricken. A large camp was formed, but the people refused to go into it, and as the Staff had their hands full, it was decided to let them camp out in spots of their own choosing, while sepoys were posted on the bridge, at the crossings of the river, and on the west side of the town, to prevent the people as far as possible going out beyond a certain radius, and getting into the villages. In this way numerous camps were formed in the wadis (gardens) and fields. These were visited daily by parties who searched the camps, and brought in the sick to hospital. There were numerous cases from these camps.

13,378. Did you disinfect the houses?—Yes, all sorts of disinfectants were used that year.

13,379. Did you lock up the houses?—Yes, and sealed them; that is, the infected houses.

13,380. And the people had to remain outside the city?—Yes.

13,381. Did any people leave the city voluntarily at that time?—A great many.

13,382. About how many?—I should say quite 20,000 went out.

13,383. Where did they locate themselves?—In what we call wadis (gardens) round about the place, and of course many of them got into the villages.

13,384. How long did the epidemic last in the first year?—We assumed it began in the middle of March, and the last case was on the 13th August, 1897.

13,385. During that interval how many cases of plague and how many deaths occurred respectively?—4,298 is, I think, the exact figure given by the Darbar, and 4,224 deaths. The deaths are pretty nearly correct from the end of April, but there were many deaths before that. The cases are quite wrong. At first we only took the mortality. I should say that for the first three months of the epidemic (that is April, May June) 95 per cent. of those attacked died.

13,386. How many deaths took place in the town itself and how many in Salaya?—There was no record kept. Salaya was incorporated with Mandvi.

13,387. Could you give us an estimate?—Yes, about 1,000 in Salaya, roughly, out of the whole lot. That is what we estimated it at from the burial grounds.

13,388. Did you get the people of Salaya into the camp?—We tried to get them out. We got a few out, I suppose about 1,000 of them altogether the first year. There were about 1,000 camped out on the seashore here.

13,389. Did they have much plague among them, when they were camped out?—No. Out of some 1,000 persons camped out along the seashore, not a single case of plague occurred that I heard of during the two and a half months they were out. These people chiefly belonged to the village of Salaya.

13,390. Did you keep any record of the cases of plague among the people who were taken to the segregation camp?—No; we did not in 1897. The cases in the segregation camp were at once taken to hospital, and the contacts were again segregated.

13,391. Generally were there many cases among the contacts?—There were a good many in the first epidemic.

13,392. When was the outbreak at its worst?—May and June were the worst months. There were 139 deaths in one day. May was the worst month by far.

13,393. Are those the warmest months of the year?—Yes, they are muggy, May is a cool month, but June begins to get muggy, owing to the monsoon coming up.

* Report on the Epidemic in Cutch Mandvi, by Lieut.-Col. Wilkins, I.M.S., published in the Report on the Bubonic Plague in Bombay, 1896-97, by Brig.-Gen. Gatacre, C.B., D.S.O., Chairman, Plague Committee.

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13,394. Is the temperature dry or humid then?—In June it is more humid. In May it is fairly dry. The average rainfall is only about 15 inches, and it is not very humid as a rule.

13,395. Did any village get affected in the Cutch State during the first epidemic in Mandvi?—Yes, there were several.

13,396. How many were affected in the Mandvi District, from the time that the first epidemic took place onwards? Perhaps you will give figures for the different districts separately?—32 villages in the Mandvi district, from the commencement of the outbreak; 23 in the Mundra District; 2 in the Nakhtrana District; 3 in the Abdasa District; and 2 in the Bhuj District.

13,397. Plague has been going on in one or other of these villages continuously since then?—Yes, ever since it began.

13,398. How was it conveyed to the villages originally?—In the Mandvi District chiefly from Mandvi. Mundra was infected from Mandvi. Numbers of people during the epidemic of 1897 went to Mundra and were let in there.

13,399. How many inhabitants are there in Mundra City?—About 10,000 to 12,000.

13,400. You had a number of imported cases there too, had you not?—Yes; between the 14th February 1897 and the 6th June 1897, they had 26 imported cases.

13,401. When did the disease break out locally?—Mundra was free for two and a half months, from the 6th June 1897. During the time they had those 26 imported cases they had 17 indigenous cases and 5 deaths. It was rather a mild type at first. After being free for two and a half months, that is since the 6th June 1897, four indigenous cases occurred on the 23rd August. From that date until the 13th December 1897, cases occurred regularly, the total during that period being 487 cases and 362 deaths. There was again one case on the 28th March 1898, but the town has been clear from that date. The total for Mundra is 504 cases, with 367 deaths. Previous to the cases on the 23rd August, when four indigenous cases occurred, numbers of dead rats are reported to have been found.

13,402. That was after the imported cases?—Yes.

13,403. Did you evacuate any portion of the town of Mundra?—Not forcibly. We persuaded a good many to go out, and a good many had gone out of their own accord, and gone to live in the wadis and fields round the different villages. That is no doubt how they communicated it to the villages. The people of Mandvi and Mundra—a great many of them—own wadis round these different villages, as well as very often houses in the villages.

13,404. Was the result of their going into camp in this manner that they communicated plague to the neighbouring villages?—Yes, the wadis are just outside the villages.

13,405. There has been no plague since March?—No, not in Mundra—practically not since December. There was only one case on the 28th March. Between the 13th December and the 28th March there were no cases.

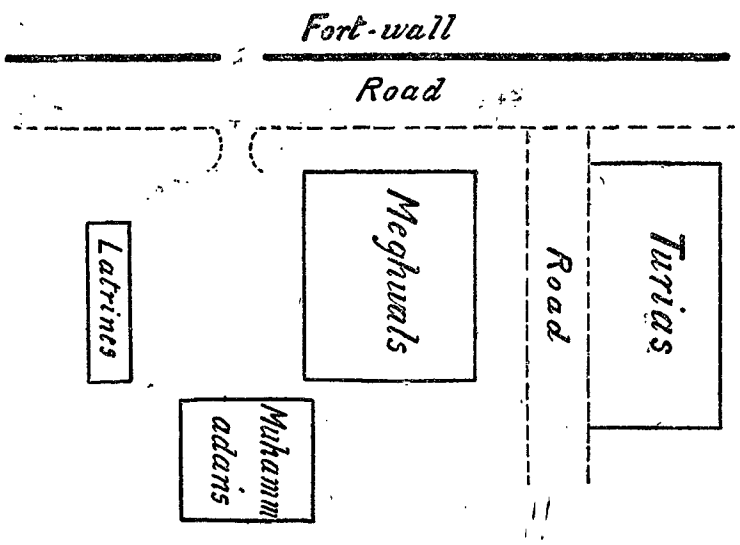
13,406. What is the population of Bhuj?—About 22,000.

13,407. Has it escaped altogether?—Yes, they have had a few imported cases—between the 25th September 1897 and the 24th June 1898 they had four imported cases at Bhuj—no indigenous. I find that they also had six imported cases between the 20th March 1897 and the 26th May 1897. All these cases except two occurred outside the town. There were two cases inside the town in May 1897. They occurred in basement houses such as are occupied by the lower classes. These were at once burnt down. There has always been quarantine outside Bhuj for 15 days.

13,408. To go back to Mandvi, did you have any casual cases during the winter of 1897–98?—Towards the end of December 1897 and the beginning of January 1898, three or four cases occurred amongst the Meghwals living outside the Sonawala gate of the town. Meghwals are low caste. They do coolies' work and sweepers' work. They originally lived just outside the Sonawala gate, and they were a standing danger to the town. After the cases in December 1897 they were removed from this position outside the Sonawala gate to a distance of about a mile from the town, into chappar huts, and they again had three or four cases in January and February, when there were no cases in the town.

13,409. Did you burn the infected huts?—Yes, but we did not move them to another site. On the 23rd February a case occurred amongst the inhabitants living in houses adjoining the old Meghwal quarters. There was a colony of Muhammadans adjoining the original quarters of the Meghwals. These Muhammadans had one case in February 1898, and the whole lot (about 80) were removed out of their block of houses for a month, and were then allowed to go back and they had no further cases.

13,410. Can you give us the history of the cases among the Meghwals, and say when the last case occurred among them in the huts?—On referring to the records, I find that three cases occurred in December 1897, and the Meghwals were removed to chappar huts on 28th December. One case occurred in their new quarters in the first week in January, two cases in the week ending 14th January, one case in the week ending 21st January, and one case in the week ending 18th March 1898, after an interval of two months. This case was the daughter of the first case which occurred in December 1897. During December, January and February, there had been no cases in Mandvi except the case of the Muhammadan stated above as having occurred in February, in a house adjoining the old Meghwal quarters. The first indigenous case inside the town of Mandvi occurred on the 9th March 1898. Another case in the new Meghwal quarters occurred on the 28th May 1898. This was the last in these quarters. I might mention that there is a colony of Turias, a caste of Muhammadans who live by weaving. These people lived on the opposite side of the road to the Meghwals in their old quarters. The sketch below will show the position.



They had one case in the week ending the 25th March and another on the 15th April. The whole lot, some 40 or 50 were segregated. They had no other cases in these quarters.

13,411. During the interval between the occurrence of this last case among the Meghwals and that of the case among the Muhammadans, were there not imported cases in the town?—Yes, but all the imported cases occurred in the quarantine camp on the Bandar, far away from the town. There were two imported cases in January and 14 in February. None of these cases got into the town. It was not till the end of March that indigenous cases occurred with any regularity, and then only one or two a day; but during the period from January the 16th to April the 7th 1898, there were 26 imported cases with 15 deaths. All these cases were from Bombay and occurred in the observation camps. During January there had been only three or four indigenous cases amongst the Meghwals. During February there was one indigenous case of the Muhammadan above stated, and during March eight indigenous cases with eight deaths. During April cases occurred in ones and twos, till the 30th April brought four cases in one day, the total for that month being 20 cases and 15 deaths. May saw the commencement of the recrudescence in earnest, and during the week, April the 30th to May the 6th, cases went up with a bound from six cases and two deaths the preceding week to 44 cases and 32 deaths. The second week in May showed 42 cases and 29 deaths; the third week 64 cases and 36 deaths; the fourth week 81 cases and 63 deaths; and there were 33 cases and 23 deaths for the remaining period from the 28th to the 31st May. May (as in 1897) was the worst month, the total during this month being 260 attacks, and 179 deaths. The grand total from the start of the recrudescence—which may be put down as lasting from the 9th March, the date of first indigenous case inside the town, to the 31st May 1898—was 288 cases and 202 deaths. The figures are from a report by me for 1897-98, which was written up to 31st May.

13,412. Can you give us the figures up to the present date?—There were 748 deaths and 992 cases.

13,413. Plague is now present in a very mild form only, is it not?—Yes, there are only two or three cases every week.

13,414. How long has it been in that state?—Ever since the end of November.

13,415. Among what people did the recrudescence commence?—It began amongst a caste called Salats, in a portion of the town called Nawapura. The Salats are masons chiefly.

13,416. Are they Muhammadans?—These cases were amongst Rajputs. There are both Hindu and Muhammadan Salats.

13,417. Were they affected in the previous outbreak?—No, they were not in the previous outbreak. The Khatris (dyers and weavers) suffered most.

13,418. Is the quarter where the Salats live very crowded?—Yes, and very dirty.

13,419. Did the Khatris who suffered in the first outbreak live at a different end of the town?—Yes, they live at the other end of the town.

13,420. Are they also Muhammadans?—There are both Hindu and Muhammadan Khatris.

13,421. Is their portion of the town particularly congested?—Yes, they are right up in a corner by the lighthouse. We have pulled a great many houses down now all round there belonging to these people—Khatris and Karwas.

13,422. Did you, during the second epidemic, endeavour to get the people outside the walls of the town?—Yes, we started this in February. We had meetings of the Headmen to persuade their caste people to go out: we told them that they could go out to the villages as long as there was no plague in Mandvi, but directly cases of plague occurred they would not be allowed to go to the villages without doing 10 days' quarantine in a camp first, when they would be given passes to go to the villages. The village authorities were given notice that no one was to be allowed in without a pass. This year I think the orders were pretty well carried out, because the villages had had much experience of the plague, and they would not let people come into the villages. There were many complaints from Banniahs and other people of Mandvi that the villagers would not allow them to go into the villages. This was even before there were any cases in Mandvi.

13,423. What proportion of the people were left in the town itself?—They did not begin to go out in earnest until May, when the cases rose, as I have said before, to 44 in one week, and then the people began to go out of their own accord. We then camped them out in different places outside the town and they were under supervision. The Police Officer and one or two others went round every day, and looked up these people and brought in cases if they found any. A staff of mounted police under a Police Officer went round.

13,424. What proportion of the town was finally evacuated?—We got out between 30,000 and 35,000.

13,425. Leaving how many in the town?—Of course a good many had availed themselves of the opportunity of going to the villages before the plague broke out when we told them they could go, and at the end of May there were not more than 5,000 or 6,000 left in the town, chiefly Muhammadans.

13,426. What proportion of the residents of the town had gone to the villages, and what proportion had remained in camp outside the town?—I could not give the exact figures. I suppose about 7,000 went out to the villages before the plague broke out, and about 20,000 or 25,000 afterwards.

13,427. Did the latter number go out into camp?—They went out into wadis round about the place. Of course some of them did quarantine for 10 days, and were allowed to go to the villages, but not many.

13,428. To what class did these 6,000 that remained in the town belong?—Nearly all Muhammadans.

13,429. What class of Muhammadans? — Khojas, Borahs, Memons, and Khatris.

13,430. Did they suffer at all in the town?—It did not attack them at first. In this quarter of the town there were not many cases, and then, through their not going out, the plague attacked them, and eventually most of the cases occurred amongst these Muhammadans who were left in the town. That was about the end of June.

13,431. Did you have a storm which drove any of the people back into the town?—Yes. We got out about 1,200 out of these 6,000, chiefly Khatris. They had been out three or four days when we had a storm, and they rushed back into the town. We got the whole of the village of Salaya, except some Sayads, turned out on the 17th June 1898, when there had been nine cases in one week, and previously only one case on the 11th May (proved to have been contracted in the city, the man being a watchman there). They were encamped on the seashore, but had to return to their houses in the village on the 24th June, owing to the storm. During the time they were out they only had one case. They were again turned out on the 28th August, when the rains were thought to be over, and during the time they were in they had 102 cases. After they were turned out the second time they had 88 cases up to the end of September, when we decided to seal up all the houses in the village to prevent the people visiting the village, and we also started boiling all their clothes. Between the end of September and the end of October, when they had again to be allowed to go into the village on account of another storm, there were 27 cases. Since they went back for the last time they have had five cases up to date, the last case occurring on the 20th November 1898.

13,432. Did these Muhammadans who went back into the town suffer more after they had gone back?—No. Strange to say it died out amongst them, and we did not clear them out again.

13,433. How far did the village of Salaya suffer altogether in the second epidemic?—They had 233 cases and 176 deaths.

13,434. Did you find it easier to get reports of cases in the second epidemic than in the first epidemic?—Yes, much easier.

13,435. Why?—At the end of January 1898, when I came down here from the districts, I got the Darbar authorities to issue a notice that no dead body would be allowed to be burnt or buried without a death certificate. They were not allowed to pass through the gates of the town without a certificate. We closed all the gates except two. We also had karkuns on the burning and burial grounds to see that no body was disposed of. We told the people at the same time

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that if they reported any sickness before death the body would not be examined after death by the doctor. They have a great horror of their dead being examined after death, and by telling them this we induced them to report their sick at once to avoid the examination, and we used to get hold of their sick on the first day That is how we kept the disease in check for so long.

13,436. Did you give any rewards for reporting?—Yes. The poorer classes used to come voluntarily, and when segregated were fed by the Darbar, and got a little money, 4 or 8 annas, for reporting the case. Of course this was chiefly to the Meghwals, Khatris, and poorest classes.

13,437. Do you think that the cases were fairly well reported in the second outbreak?—There is no doubt they were this year. By getting hold of the cases at once on the very first day, of course the sick stood a greater chance, and there was not so much infection amongst the contacts. We only got about three cases in the general segregation camp.

13,438. What would be the number of contacts among whom these three cases occurred?—I have not got the exact figures.

13,439. Could you give them approximately?—Judging from the number of cases, I suppose altogether at different times during this second epidemic there must have been at least 1,000 to 1,200 segregated in the general camp, taking five persons per infected house, according to the hospital returns.

13,440. Only three cases of plague occurred among them?—That is all in the segregation camp. I refer to the *general* segregation camp, not the caste ones. Then latterly we have been singularly free from cases amongst the people coming from Bombay. Since the 9th September 1898 to date there have been no cases. There is another thing I should like to mention. In the first epidemic, when cases died in the houses we found that many families lost three, four, or even 10 members, but last year (1898), by getting hold of these sick people at once, it was very rarely the case that a family lost more than two or three of its members—as a rule, only the man who was taken ill. These people in the segregation camp were kept segregated for 10 days, then they were allowed to go out to work. They were kept in the camp for 20 days altogether. During the last 10 days they were allowed to go out and do their work, but they had to come back to the camp in the evening.

13,441. During those ten days were they permitted to go into infected quarters of the town?—Yes, the poor people who did coolies' work and had no means of living, except what they got daily. Practically the whole town was infected. They were not allowed to go and live in infected houses nor could they go into them at all, as they were all sealed up. Their names were registered, and if they did not return to the camp in the evening they were arrested, and not allowed to go out. There were very few cases of this. Masons, carpenters, and such people were allowed to go out for the day, after they had done ten days.

13,442. Did you take measures to disinfect their houses?—Yes, at once. The floors were dug up, grass and litter burnt on the floors, and then the earth was all removed, and the houses, after being limewashed, were sealed up, grass was also burnt in the street or courtyard. The people were not permitted to occupy the houses till 20 days after they were segregated. They were however allowed to go work in the town. This was in 1898. The floors were not dug up in 1897 or grass burnt.

13,443. Had you many caste hospitals?—Yes, Lohanas, Banniahs, Bhattias, Brahmans, Memons, Khojas, Borahs, and the Muhammadan hospital at Salaya, though some few of these latter also came to the General Hospital.

13,444. Did the people go readily to hospital in the second outbreak?—Yes, they much preferred this measure of having caste hospitals to having one large hospital for all Hindus, as in the epidemic of 1897.

13,445. What measures did you take in the villages?—As soon as a case was reported as having occurred in a village, a party of sufficient strength to search the village in one day was sent out. All cases that were found were sent to the nearest established hospital; or if the village was too far from any such hospital a chappar one was erected outside the village, if a suitable building in or near the village could not be found. A large camp was then formed for the healthy people, except the Meghwals and low castes, who had a separate camp close by. Each caste had its own line or lines of huts, and the camp was surrounded with a high and thick thorn hedge (which is easily procurable in the vicinity of every village) with one entrance. Two sepoys by day and four by night guarded the camp. The huts were in line with a considerable space between each hut, and a wide road between each line. There is always suitable space around every village, so that there is no difficulty as to room. To each hut was fastened a wooden slip with the number of the hut and the number of the people living in it. A sepoy, or karkun if procurable, had charge of one or more lines according to the size of the camp, and called over the names of the people in his charge at sunrise and sunset. As he came to a hut the people stood outside, and answered to their names. They were also medically examined daily by the Hospital Assistant. As soon as a case occurred in any hut, the patient was removed to the hospital, the contacts to the segregation camp, and the hut burnt down. The actual contacts were of course not allowed to leave the segregation camp until they had done ten days there. Allowing the people in the health camp to go about their avocations made a great difference in their contentment and resignation at having to turn out. I consider there is no danger in this, and moreover it is a thing which must be allowed, especially at a time when there is so much work to be done in the fields.

13,446. Were the people allowed to visit the village?—Yes, at that time there is no doubt that they did, but afterwards we took to sealing all the houses in a village when it became infected.

13,447. When did you adopt that course?—About the end of last September (1898). We found in the case of the villages of Gundiali, Salaya, Muska, and Bhujpur, that the plague kept going on amongst the people although they had been turned out a long time. First of all these villages had been only partially evacuated, but when we found cases were still going on we turned out the whole village. There was no doubt that the people kept going to their houses or into the village, so I gave an order that all the houses in the villages should be sealed up. Within a short time after the disease practically ceased. Excellent measures by way of disinfection, and removal of tiles, under the direction of the Chief Medical Officer of the State, were taken with regard to Parjau, but when I visited the village in the beginning of December I found the Jadejas had only just turned out, the plague having then attacked them, though the first cases were on the 1st October. I also found that the houses had not been sealed. This was at once done and there were only 5 more cases. The last case was on the 23rd December.

13,448. Do you think that the results of complete evacuation were favourable?—Yes.

13,449. Can you give us any instances?—In the case of he villages of Moti Khaker, Luni, Patri, and Beraja, here was a class called Jadejas, one of the many clans tf the Rajputs, among whom there are as many clans as among the Scotch, the chief being the Jadeja, Gohal, Hala, Jhala, and Waghila. The Jadejas are the same caste as the Rao, and in deference to their wishes we at first allowed them to remain in these villages, after they were infected. This class occupies a separate corner of the village which is walled in quite apart from the village, in fact they occupy a small fort or citadel. We allowed them to remain, but after the plague was declining amongst the ordinary population, which had been turned out, these Jadejas got it eventually in each case, and we had to turn them out; in fact they turned out themselves, in those four villages.

13,450. Had these Jadejas any communication with an infected portion of the village, or with the infected people in camp?—They do not associate much with the other people. They keep their women in very strict pardah; that is why we allowed them to remain in. Latterly, owing to their always being eventually infected, orders have been given to turn them out with the others. Of course the men did not confine themselves to their own quarter. They probably went about the village and outside. They may possibly have communicated with the people in the camp, but it has never been reported. They are supposed to be kept separate, though, of course, one cannot say for certain that they never went near the people in camp. It is very difficult to say, unless one is always on the spot, but both Dr. Mason and I thought that they became infected through staying in the village. I find from

looking at the records that in the case of the village of Beraja, the first person attacked was the wife of the Tilat (Chief) of the Jadejas. She certainly could not have gone into the village or mixed with the people out in camp. Her two female attendants were next attacked. The Jadejas' quarters had not been infected before, as it was the first infection.

13,451. What you have stated shows that partial evacuation has not been entirely successful. Can you give us cases in which the figures show that complete evacuation has been successful in stopping the disease?—Take the case of Kathda, population 910. The first case occurred on the 18th May, 1897. The place was evacuated when there had been from 15 to 20 cases about the end of May. The disease ceased on the 13th June, 1897. There were 8 or 10 cases outside.

13,452. Is there any other case which you wish to refer to?—There is the case of Durgapur, with a population in 1890 of 1,400. On the 17th January there were three cases; the people were turned out, and there were no more cases. These three were probably imported cases. On the 8th November 1897, two more cases occurred, the people were turned out on the 9th November, that is the next day. There were six cases afterwards. Until the end of 1897 none of the villages were turned out early enough, the people were not kept under proper restraint, some of them were allowed to remain in the village as above stated, or they were allowed to visit their houses in the village, so that, in my opinion, complete evacuation on the first appearance of cases has not been given a fair chance until lately. I put in a statement* that shows that most of the villages which have been turned out early gave good results, and I have not the least hesitation in saying that early evacuation properly carried out is the best thing. The last one occurred on the 24th January 1898.

13,453. To return to the town of Mandvi, do you think that the partial evacuation of blocks in the town has been successful in stopping the disease?—It certainly checked it, and gave the people time to turn out before they got badly infected. I do not say it stopped the disease; the people going out did that, and, wherever possible, there is no doubt that it is better to evacuate the whole place.

13,454. Did you find that when the people moved out from one block the disease spread to the neighbouring block in their absence?—I could not say that for certain. The cases cropped up all over the town. There would be cases on this side of the town one day, and cases on the other side on the next day, or on the same day. The first few cases were confined to a quarter called Nawapura.

13,455. I suppose that, as far as the town is concerned, you have not got much actual proof of infection having been started again by people revisiting the town?—No, I believe that the plague, after raging as it did in 1897, died out, or rather became weakened, but that some germs of the disease lay dormant and recuperated. It is strange that the epidemic of 1897, which was so severe, completely ceased on the 13th August, and we certainly had no cases till December, when the three cases amongst the Meghwals outside the town occurred, and there was no indigenous case inside the town till 9th March 1898; whereas up to date—although measures were at once taken at the commencement of the epidemic of 1898 commencing from the 9th March, and also before, as previously stated, and the disease has been kept down to 922 cases against over 4,000 (probably many more) in 1897—we have never been entirely free from the disease except for 15 days in the early part of December. We have always had a few cases every week up to date, and I think that in the first epidemic the disease simply worked itself out. Far greater precautions and stricter measures were taken during 1898.

13,456. Can you give us any instance of the infection being started again by people revisiting the infected area in the villages?—Yes. There is no doubt that the disease is kept going by the people visiting the villages. In the 1898 epidemic, in the villages of Muska and Gundiali, the disease continued long after the people had been turned out, although every precaution was taken in the way of boiling clothes, &c., and we then came to the conclusion that the continuance of the disease was due to the people visiting their houses. For some days the disease would appear to be declining, and then there would be again a rise in cases. We then decided to seal up all the houses in the villages. This was done about the end of September, and the disease stopped completely in a fortnight to a month with few more deaths. In the case of the village of Bada, there had been no cases for 17 days, when the people were allowed to go back to their houses for four days on account of rain, and immediately they came out there were four cases. We found the same with Salaya. The disease was decidedly on the decline, then we had to let the people go back on account of a gale coming on, and immediately there was a rise in cases. Directly a village is evacuated now, we seal up the houses, as there is not the least doubt in my mind that people being allowed to visit their houses or doing so surreptitiously keeps up the disease. I consider that no village should be allowed to be re-occupied under at least a month from the date of the last case, and the longer the people are kept out the better.

13,457. Why do you think that it is necessary not to allow a village to be re-occupied in less than a month from the date of the last case?—In the Mundra District we kept them out for two or three months, especially in the worst cases, and as yet there has been no recrudescence; they have been back in their houses nearly a year. In no instances have we had cases soon after re-occupation, but only after many months (if at all), and we consider these as cases of recrudescence.

13,458. Did you disinfect the houses in the villages?—Yes, all the infected houses. If it occurs after the people go back, as on account of rain, we disinfect every house in the village. When I say disinfect I mean we limewash them. In the first epidemic in Mandvi in 1897 we used lots of different and expensive disinfectants, but during the last year and in the villages we never used anything but lime, and occasionally sulphur. It seems to have been just as good.

13,459. (*Dr. Ruffer.*) Quick lime?—Yes. Mundra has not had a case now for 13 months, and all the villages have been free for nearly a year except Bhujpur. We cannot tell that they may not get it again. Gundiali and Muska have had a recrudescence much about the usual time, but the Mundra villages have not. The people were turned out in the Mundra villages much sooner.

13,460. (*The Chairman.*) In how many of the Mandvi villages did you have a recrudescence?—In the Mandvi District there has been a recrudescence in three villages, not including two or three which have had only one or two cases. In two only has it been bad, viz., Gundiali and Muska.

13,461. During the occurrence of the plague in Cutch, have you heard much of mortality among rats?—No. They have had dead rats in Bhadresir on two separate occasions. The houses in which these dead rats were found were treated as infected houses. No epidemic followed this death rate amongst rats, and the place has only had four indigenous cases since plague came into Cutch. Though I have daily visited the town of Mandvi for months during the two epidemics, and visited hundreds of infected houses, both before the disinfecting parties came to them, and during the process of disinfection, I have come across very few dead rats, and have been particularly struck by it. I think I could safely say that I have not seen more than a dozen. At Patri, Bhujpur, and one or two other villages, dead rats have been found prior to an epidemic, but I have never received any report of what might be called an epidemic amongst rats.

13,462. How do you think that infection is carried from one place to another?—I should say by people, chiefly. I think there can be no doubt that people going from Mandvi to these villages during the first epidemic infected them. I think it was personal infection. In the case of Bhujpur it was reported that the village had been infected through gunny bags from Bombay.

13,463. Will you give us the details?—The first case was a Banniah who was in the habit of going backwards and forwards to Bombay, and trading in gunny bags which he brought to Bhujpur for sale, for the storing and export of grain. He was attacked on the 31st July, 1898, and two other Banniahs who, it is said, bought gunny bags from him; and as there was then no communication with Bombay by sea owing to the monsoon, and the man must have come to Bhujpur not later than the end of May when the steamers ceased running, the attacks were put down to the gunny bags.

* *See* App. No. XLV. in this volume.

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13,464. Was there no possibility of anybody else having brought infection into the village?—No, because there was no plague at that time in the Mundra District. As far as I could ascertain, this man did not go to Mandvi or elsewhere.

13,465. What was the nearest village infected?—At that time the nearest place would be Mandvi. There was no plague in the Mundra District then.

13,466. How far would that be from Mandvi?—About 18 miles from Mandvi.

13,467. Was the man attacked constantly getting goods from Bombay?—Yes, he trades with Bombay, and constantly goes backwards and forwards.

13,468. And he would be constantly getting things from Mandvi?—Yes, he probably did get things from Mandvi.

13,469. Did he get clothes as well as gunny bags?—I do not know that he did. He trades in gunny bags from Bombay, and as Mundra District was free, and there was nothing to show that he had lately been to Mandvi, and, as he was the first attacked, it was thought that he might have got infected from the gunny bags.

13,470. It would not be unlikely for him to get clothes from Mandvi or Bombay?—He might. It is true there was plague in Mandvi. It was reported that Bhujpur was infected by these gunny bags from Bombay.

13,471. Still, it is not impossible that this man might have got infected from Mandvi?—Yes, it is not impossible.

13,472. Has there been any case in which a village has apparently become infected this year by reason of its adjoining a village which was infected last year, there being no evidence of any infection this year by means of human beings?—No. I could however in the case of the village of Undote, which is four miles from the village of Bayeth, and six from Bada, get no evidence as to there having been any communication between Undote and Bada, or between Undote and Mandvi, or any other places infected at that time. Bada had the plague badly in 1897, and so had Bayeth. Bada has had a slight recrudescence (15 cases commencing the 12th November 1898) while the cases at Undote commenced on the 24th December. Bayeth, the nearest village to Undote, has had no recrudescence. and the last case occurred on the 8th February 1898. Still, though I could get no evidence as to communication with any infected area, I expect there was, and do not believe in a village becoming infected, solely by reason of its proximity to a village previously infected.

13,473. Did you find it advantageous to remove the tiles of the houses?—Yes, we did.

13,474. Can you give us any instances of the benefit resulting from this measure?—I cannot say for certain. I simply state the facts. The measure is only good in the case of basement houses. It occurred to me last January that if a recrudescence was to be expected about March or April, the removal of a good portion of the tiles from the houses in the city of Mandvi, and suburbs of Salaya, thereby letting in sun and air to the interior, might do good, and certainly could do no harm. This was done in Mandvi and Salaya about January last (1898), but was not done through oversight in the case of the houses outside the city walls, where a population of some 6,000 persons reside, for the most part in basement houses. Salaya contains a population of about 5,000 persons, chiefly fishermen and sailors all living in basement houses. Last year this suburb of Mandvi was reeking with plague, and, though the death rate cannot be accurately stated owing to its having been incorporated with Mandvi, the number of deaths amounted to certainly 1,000. A population of about 5,000 persons also live in such houses within the city walls. Now up to the 31st May there had only been one case of plague in such houses in Salaya (proved to have been contracted in the city, the man being a watchman at a rich Banniah's house) and only three in the city; and from two of these houses I found that the tiles had not been removed. I did not pay any attention to the matter at first until I found in my daily rounds that no cases seemed to be occurring in basement houses, which, belonging to the poorest classes, are naturally situated in the worst parts of the town, and where (especially in the Khatri quarter) the plague was very bad last year (1897). Since the rains commenced and the tiles were put on again, there have been several cases in Salaya, but only six or seven in such houses in the town. I cannot then say for certain whether this measure assists in killing the recuperating germ, and checking the disease. I am inclined to think that if the tiles are properly removed about a yard in width, say in two places, and a strong light let into the rooms, it may do good. But the people seem very averse to opening out their houses sufficiently, and a constant watch on the houses was necessary. In the houses outside the walls where the tiles had not been removed, we had 28 cases up to the 31st May. In June 1898 we ordered the tiles to be removed from the houses in the villages of the Mandvi District which were infected in 1897.

13,475. Was that in your opinion beneficial in the villages?—I cannot tell. I can only say that there has been recrudescence in only three of those infected villages. 13 other villages that had it in 1897 escaped, viz.: Godhra, Bayeth, Meran, Tanwana, Kathda, &c. All these had plague badly in 1897, and they have escaped. I have not included those with two or three cases, but those fairly attacked.

13,476. Have you noticed anything which would lead you to think that people employed out of doors during the day are less liable to plague?—No, judging by the Salaya people who are all fishermen and sailors. There are a few Banniahs in the place, but very few. The people are occupied all the day in fishing or exercising their calling—plying their boats—and they had it very badly.

13,477. They are not out at night?—No, they sleep in their houses at night, and it may be noted that the houses are very dark and ill-ventilated, though clean. They are out the greater part of the day. In the recrudescence of 1898 we noticed that the women were chiefly attacked. This may have been, and I am told was, the case in 1897, but it was not noticed by myself.

13,478. Did you notice any difference in the way in which the disease attacked and affected the Hindus and Muhammadans respectively?—There were fewer cases among the Muhammadans in the town. Of course, in Salaya they had it very badly, and they are nearly all Muhammadans. But in the town I think the Muhammadans suffered less than the Hindus.

13,479. Did you notice whether the Muhammadans had any greater power of resistance than the Hindus?—Yes, I think we had more cases of recovery among the Muhammadans in proportion. Of course, there are fewer Muhammadans in the city, but taking the proportions, I think there were more recoveries among the Muhammadans than amongst the Hindus.

13,480. Did the disinfecting gangs escape generally?—Yes, in the epidemic of 1897 we had several cases (eight, I find) amongst the coolies from Bombay, but not many, considering we had 300 of them. In 1898 up to the date of my writing my annual report in August, there had been no cases amongst these disinfecting parties. There were two or three afterwards. Another class which escaped were the Waghris, living in grass huts outside the town. Waghris may be termed shikaris, and are often employed for bringing news of game. In Gujarat they net quail, and sell them. Here they make baskets for sale, and also work as coolies in the town. There have been no cases amongst them. The sweepers and disinfecting gangs lived outside the town in chappar huts. The Natras, who also live out in the open, have escaped, though they were to be met every day in the town. They are gipsies, and live chiefly by begging, but also make small iron things for household use, such as tongs, spoons, &c.

13,481. As far as your experience goes, do you find that disinfection has been beneficial?—Nearly all the houses in Mandvi were limewashed during the epidemic of 1897, those that were infected, as well as those that were not, with this difference, that the infected ones were treated with special disinfectants. During the epidemic of 1898, I took notes of over 200 houses, and I have, as regards these houses, found that the cases for the most part occurred in fresh houses, and not in the ones infected last year, though they have generally been in the same delis. I cannot give the exact figures, but knowing the town so well, and having visited nearly all the infected houses on both occasions, I could tell sufficiently accurately.

13,482. How many of these had been infected a second time after disinfection?—In six or seven houses only had there been cases a second time after re-occupation.

13,483. Could the infection have come from outside in any of these cases?—Yes, for instance, there is one case

in which a man had occupied a house for six months before the second case occurred. In three or four cases the disease broke out in the same house after an occupation of 10 or 12 days, but in this one case there was an interval of six months.

13,484. In the cases in which it broke out after 10 or 12 days, had you any reason to think that disinfection had not been completely done in the first instance?—I cannot say that. It is quite as likely that they got it somewhere else, as the disease was in the city.

13,485. What climatic conditions did you find favourable to the increase of the disease here?—We found that in damp weather the number of cases increased. The disease was declining in Mandvi about the end of June, but we got a Scotch mist for three or four days, and during that time the number of cases went up. We found that the same thing occurred in 1897, when there was a very heavy dew. We generally found that when the atmosphere became charged with moisture, we had more cases. I do not know whether heat or cold makes any difference. Mundra had it in the cold weather, while here we had it in the hot weather.

13,486. Is Mundra a dryer place than this?—No, much the same.

13,487. Can you tell us anything about the prevalence of the different types of plague?—We have had all three. We have had the bubonic, and the pneumonic, and cases which were neither the one or the other, and which died in six or eight hours.

13,488. Can you tell us at which time each of these types was respectively prevalent?—No, I could not say exactly the periods at which they occurred, but in the epidemic of 1897, it began with a very virulent type, people dying in six or eight hours, then it took the pneumonic form, and latterly we had the bubonic. During 1898 it has been chiefly bubonic. In 1897, at Mundra, it was more bubonic.

13,489. All through?—All through. They have only had one epidemic. There were pneumonic cases, but it was chiefly bubonic. There were 504 cases and 367 deaths, which is a mortality of about 72·8 per cent., while the mortality in Mandvi during the first epidemic was about 95 per cent. This year, 1898, the mortality was about 75 per cent.

13,490. What type of disease did you get in Salaya?—Pneumonic and septicæmic.

13,491. Have you seen any case of a person having plague twice?—There was one case to my certain knowledge of a Brahman boy who had the plague twice, and recovered. He had it in the General Hospital in 1897, and in the General Hospital in 1898.

13,492. Both attacks bubonic?—Yes, I think so, but I will not be sure about that. At any rate he had it twice. The boy was very anæmic, a wretched boy, his arms simply nothing but skin and bone. I put in the boy's bed ticket* for 1898. I cannot find the other for 1897, though a strict search has been made. The boy, an Atit (holy caste), was in both years under the charge of Dr. Mason, who took a special interest in his case owing to his having had plague twice. It will be noticed that it is stated on his bed ticket that he had plague in 1897. He was a long time in hospital on both occasions and I saw him frequently.

13,493. In the second outbreak at Mandvi, what type of plague prevailed?—In the second epidemic it was more bubonic, and less virulent altogether.

13,494. Did you notice cases in which the people were led by their fear of plague to neglect their ordinary duties to their relatives who were sick?—Yes; in the first epidemic we several times found the house locked up and the people gone, in some cases we found dead bodies in the houses, on another occasion we found two men down with plague and deserted.

13,495. The house was locked and the contacts had disappeared?—Yes. We had great difficulty in the first epidemic in getting people to carry the dead.

13,496. Did you have any inoculation here?—Yes. These are the figures given by Dr. Mason in the recrudescence: that in 1898, 68 patients in the various hospitals were inoculated with Yersin's serum, 44 died and 24 recovered. 1,044 persons of all ages have been inoculated with prophylactic serum, of which five were attacked with plague, two died and three recovered.

13,497. Did the report state how long after inoculation these people got plague respectively?—Yes, the particulars are given.

13,498. In what month was the inoculation done?—This will be found in Dr. Mason's report. 55 persons in the segregation camps were inoculated from July to August 1898. Amongst them there was no case of plague. They were allowed to occupy their houses after three days.

13,499. With the same serum?—Yes, we have only had Yersin's serum here; that is all the information I can give about inoculation.

13,500. Can you put in Dr. Mason's report?—Yes, I will put that in.†

13,501. Did you try cordons at any place in the Cutch State?—Yes, at two places, Beraja and Patri. We did did not find them any good.

13,502. Of what strength were they?—I cannot give you them exactly.

13,503. Did you find that they were liable to be broken?—Yes; the sentries were certainly 100 or 200 yards apart, but I do not think they would be any good in any case, unless you had a large disciplined force, and the men quite close together.

13,504. The Darbar have carried out certain improvements in Mandvi, have they not?—Yes.

13,505. Can you tell us what they were?—Dr. Wilkins and I went round and marked certain houses for demolition. He proposed that there should be a wide space between the fort wall and the houses. There were many houses quite close up to the fort wall, and some of them built against it. These were marked out, and they have all been pulled down now. A road will be made as soon as it can be levelled down, of a width of about 20 feet. All the latrines have been moved out of the town, and put outside. The gaulies (milkmen) have been removed, and also the brickmakers, and oil mills have been removed.

13,506. Has anything been done to improve the conservancy of the town?—Yes, more sweepers have been put on, and the town is generally cleaner.

13,507. (*Dr. Ruffer.*) What were the measures for the the examination of passengers from Bombay and Karachi?—All the ports of Cutch were closed with the exception of Mandvi and Khari Rohar, the latter being the point of entry by land route from Bombay, Gujarat, and Kathiawar. The arrangements made by Captain Mason last September for quarantine against Bombay and Karachi have worked very well.

13,508. How did you examine them?—When they landed they were made to go into an enclosure. We had a sort of barrier with a shed at the end of it. They could only go in one at a time, and they were examined by Plague Nurses and Hospital Assistants. After examination, they were given tickets and their names, &c., registered. They were then marched off under escort, to the various quarantine camps for eight days, and while there, were examined daily, and were given fresh passes on the day they left. At the time of landing, if any had a rise at all in temperature, they were sent to an observation camp, and any cases about which there was no doubt were sent to hospital.

13,509. Were the axillæ and groins of passengers inspected?—No; they took the temperature, and felt their pulse, that is all—examined their tongues.

13,510. Were the people who went into the quarantine camps disinfected?—Yes.

13,511. How was the disinfection done?—Their clothes were boiled. They were made to open their boxes and put everything out into the sun, and also their bedding.

13,512. For how long?—For three days. Their bedding was put out every day. The only things we did not boil were silks, and things like that, which would have been damaged. Everything else which could be boiled was boiled.

13,513. Do the boats proceeding from here to Madagascar take out a bill of health?—No, they do not.

13,514. Do the crews pass a medical examination before starting?—I do not know that they do.

13,515. Is there a Port Officer here, a medical man?—A medical man, not a regular Port Officer. Of course they all carry passes signed by me if going to foreign

* *See* Appendix No. XLVI. in this Volume.

† *See* Appendix No. XLVII. in this Volume.

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ports, but I do not know that they have been medically examined.

13,516. At the present moment what measures do you take against Bombay and Karachi?—The same quarantine arrangements, except that those who give security to appear for medical examination for 10 days are allowed to go out after being disinfected. We examine everybody going to Bombay, Karachi, Jamnagar, and Kathiawar. I do not know that the boats which went to Madagascar and Zanzibar and other foreign ports were examined, because, of course, they take six weeks to go, and it was not thought necessary, probably.

13,517. How did you first hear of plague being present in Mandvi?—I heard it anonymously, that there were more cases than were reported.

13,518. By the time you heard of its existence the disease had made much progress, as you found 22 cases?—Yes, there had been a few cases previous to April the 12th. On April the 10th I heard that it was worse than was reported, and I at once came down here.

13,519. The first imported case was in October, and the plague did not actually break out till March; had there been several imported cases in the interval from October to March?—The first indigenous case (that is, reliable one) was reported to have occurred in Mandvi on the 18th March. From October to that date there had been 27 imported cases from Bombay, and 11 from Karachi between the 11th and 17th March. We assume it broke out in March because there had been many cases by the 12th April. When I came down here on the 12th April there were 22 cases on that day.

13,520. Do you think the plague may have been in Cutch Mandvi during the winter?—I do not think so, because otherwise the mortality would have gone up much more quickly and I should have heard of it.

13,521. Supposing there had been only two or three cases a week, would they have been reported to you?—Yes, I think so, but I could not say for certain, because they did not know much about it here; they were quite inexperienced. What I mean is, that if they had been recognised as plague cases and reported to headquarters, I should probably have got a return about them. No doubt a good many cases were concealed, but if indigenous cases to any extent had been occurring during November, December, and January, I think the disease would have burst out into a conflagration, beyond concealment, long before April.

13,522. Do you think plague may have been in Mandvi for some time before April?—No, I do not think so. I should say, perhaps, a month or six weeks before—indigenous cases.

13,523. With regard to the small epidemic you had at Rawapur, can you tell us the date of the arrival of the first case and the dates of the various deaths? Were there only 11 cases?—Yes, the first case was on the 11th February, and then cases on the 13th, 14th, 20th, 21st, 24th, 27th February, and the 4th March 1897.

13,524. When did the first case die?—He died on the same day. The first case was a tailor (one of three) from Karachi, which is put down as imported. It was probably reported the day he died, but he had had it most likely for two or three days before that. Then on the 13th February there was a member of the family, which was put down as an indigenous case. He was reported as having died on the same day. On the 14th another of the tailors from Karachi died, and three of the family also died, that is four cases on the 14th, one imported. On the 20th there were three deaths, and on the 21st two more deaths; on the 24th one; on the 27th one, and on the 4th March two deaths, making a total of 13, and two from Karachi, 15 altogether. The third tailor from Karachi did not contract the disease.

13,525. Was the house in which the patients lived disinfected after the 14th. There was an interval of six days between the 14th and 20th?—They were not turned out, I think, till the last cases.

13,526. Neither houses nor clothing were disinfected?—That is what I understand from the report of the Darbar. It says they were then turned out and also the people in the surrounding houses.*

* NOTE by Witness on correcting proof of his evidence:—I now find that after the deaths on the 14th, the family was segregated, and moved outside, but I understand that the people in the adjoining houses were not removed till later. All the houses were disinfected and limewashed.

13,527. What medical staff had you in the hospitals here?—Dr. Wilkins was here for 2½ months, May, June, and half of July, and then Dr. Mason remained here till October 1898. During the first epidemic in 1897 we had roughly 14 Plague Nurses working in the hospital. These were reduced, and from August 1897, when the plague ceased in Mandvi, we have had three. Then there were seven or eight Hospital Assistants besides compounders. Also Drs. Shroff and Nanji.

13,528. What staff did you have in 1898?—Dr. Mason, seven Hospital Assistants, and the three nurses. Then, of course, we had several Darbar servants, compounders, the Municipal Secretary, and the police, and 50 men of a native regiment.

13,529. How many European doctors were there?—Only Dr. Mason, except during the 2½ months that Dr. Wilkins was here. Dr. Ricketts had charge of Bhuj and the neighbourhood, in addition to his duties with his regiment, and there were two L.M. and S. doctors of the State.

13,530. I suppose Dr. Mason had some work in the town as well?—Yes.

13,531. Did you find the people objected to European treatment?—The Jadejas would not allow Dr. Mason into their houses at all. They did not mind the nurses.

13,532. And in the hospitals?—We had no bother at all in that way. The Muhammadans were a little troublesome, chiefly the men in Salaya, but the Memons, Khojas, and the Borahs gave no trouble, and the people in Salaya did not give much trouble after the first epidemic.

13,533. Did many attendants on the sick get plague?—Of the nursing staff one Eurasian nurse, two ayahs, and two orderlies died. The nurse had had a long standing ulcer on her foot, which she never reported. At 7 a.m. she went to the hospital laughing, and apparently perfectly well—at about 9 a.m. she began to stagger, and died the next day. One European nurse, Miss Jones, got a mild attack of plague—I think bubonic—and was about again in a month or so. It was only latterly, in 1898, that we allowed relatives to attend on the sick.

13,534. Did you find that the relatives got plague?—No, not in many cases.

13,535. Were there any cases of infection of relatives in the hospital?—Eight cases have occurred amongst the relatives attending the sick in hospital during 1898.

13,536. What was the largest number of people at any one time in the hospital?—Roughly, in the General Hospital in the epidemic of 1897 there were between 200 and 300; I think at one time close on 300. Many came in only to be taken out again in two or three hours.

13,537. How did you ascertain the deaths in the segregation camp?—The cases were sent to the hospital. The general segregation camp, in which there were only three cases, was under a guard of sepoys. The caste segregation camps were close to the caste hospitals, and were visited daily by Dr. Mason, myself, or the nurses, or someone of the staff.

13,538. Did you find that the people died in the segregation camps before they could be sent to hospital?—No, we did not find that. There was not a case to my knowledge that died in the camp. I am talking of 1898. The arrangements of 1897 have already been explained.

13,539. Do you think the inmates of the segregation camp could get rid of the dead bodies without your knowledge?—I do not think so. They might have in 1897—probably did—but the arrangements were better in 1898, and there was not much to be gained by their doing so. Had there been any case I think we should have managed to catch one at least.

13,540. By burning or burying?—I do not think so. We had British sepoys, Native Infantry, instead of the Police here, in the segregation camp and the quarantine camp.

13,541. You know the mortality in the segregation camps, and you have no doubt that was the actual mortality?—I have no doubt of that in 1898.

13,542. Out of the 4,224 deaths in the first epidemic, how many occurred in the city, and how many in the segregation camps?—There was no record kept of the cases from the camps in 1897. I know however that many cases came into hospital from the camps

outside. I used to go round almost daily, and I discovered 15 cases in one day in the camps. The figures for 1898 are—

General segregation camp	3
Khoja	2
Bhatia	3
Memon	4
Banniah	4
Lohana	9
Brahman	2

The above do not include Salaya, but only the caste hospitals at Mandvi.

13,543. Do you know the number of deaths among the runaways to neighbouring villages?—No. There was so much to do in Mandvi, during the epidemic of 1897, that the villages were really rather neglected. Many of them were not turned out until they had had the plague for six months. In Gundiali, Muska, and other places it had practically died out, and the disease would probably have soon died out in any case, even if we had not turned the people out.

13,544. Do you know why the town of Bhuj escaped?—Because they have had very strict quarantine. All the gates except one were shut during the first epidemic, and only the postern of this, I believe, was kept open and strictly guarded. Ten days' quarantine was imposed at Daisra, a village half way on the road from Mandvi to Bhuj, and again 15 days' quarantine outside Bhuj. There was also quarantine at Khari Rohar. Two cases only occured inside the city, and I could never discover how they got in, but the houses were at nce burnt down.

13,545. Is it a walled town?—Yes, and there is no break in the walls. People who wanted to go to Bhuj during 1898 were kept in quarantine ten days here, in Mandvi, and ten days at Daisra.

13,546. Did imported cases get into the town?—No, not in 1898, they were all outside. Two got in in 1897, as stated above. We count them against Bhuj, but they were all outside the fort walls. They were found out before they got in.

13,547. What system of death registration is there here?—There was none in 1897 at all, at the time the epidemic broke out.

13,548. What system is there now?—Only giving these death certificates. We also get returns of deaths from ordinary causes daily. We also get weekly returns of deaths in the Mundra and Mandvi Districts.

13,549. Is your system of death certificates in force now?—Yes.

13,550. Do the people object to it all?—We have not had any bother with them at all.

13,551. Do the Muhammadans object to it?—No.

13,552. Do you prefer that system to corpse inspection?—No certificate is given unless the doctor has seen the person, either before or after death. Corpse inspection is made if the man has died and no report has previously been made of his sickness. At the same time, as the relatives very much object to their dead being examined, and in order to induce them to make reports, notice was given that if they reported the illness, and the doctor saw the sick person, no corpse inspection would be made, and a certificate would be given without further ado. If a man dies in a house and the family has not reported the fact of his being ill, they are fined. They do not like it, but it is the only way in which we have managed to keep them in check They generally try to get out of it by saying that the man went to bed all right, and was found dead in the morning. I have great faith in getting hold of the first cases, and getting them early, and think that every means should be taken to this end, next to keeping it out altogether. I think we can safely say that the epidemic of 1898 was comparatively slight, owing to our being able to get the cases early, and segregate the people before they had time to become infected. I think this is borne out by the fact that we in 1898 had only 748 deaths, against 4,224 recorded in 1897, and the probability is that the deaths were nearer 5,000.

13,553. Do you know how the Meghwals were infected?—Though they were removed to chappar huts about a mile from the town, they used to go into the town to work. That however would not be a reason for infection, because there was no plague then. I cannot say how they got infected unless it was through clothing brought from the old quarters. Their clothing was not disinfected I believe, and Dr. Mason reported that he thought the cases were due to clothing which they might lately have taken into use. I was not there at the time, being in the districts.

13,554. You do not think there were undetected cases in the interval between the two epidemics: can you exclude that possibility?—I do not think there were. From the 13th August there were certainly no cases until the three or four cases ascertained in December amongst the Meghwals. Then they were removed. None came to our notice in the city itself. Certainly we had not introduced death certificates then, and cases may have occurred, but I think it unlikely for so long without attracting attention. There was registration of deaths, and if there were any cases the dead must have been secretly disposed of. On the whole I think that the town was quite free at that time. It was not till the middle of February that we introduced this rule of not allowing people to burn or bury their dead without certificates.

13,555. Were they disinfected at the time they moved into the huts?—No, I think not. Only those who had been in contact with the December cases were segregated. When I went to Mandvi at the end of January, on my return from the districts, I found no boiling of clothes going on in the quarantine camps, and at once ordered it.

13,556. Do you think that people may be buried or burnt in the town without the knowledge of the authorities?—I do not think so.

13,557. Is it quite impossible?—Quite; there is nowhere to bury them at all inside the town.

13,558. Do you know of epidemics of plague in villages which stopped spontaneously and quickly without evacuation?—Some villages had three or four cases, and were not turned out, and we heard of no more cases.

13,559. Can you tell us their names?—Bhambdai had one case and no more, although it was not turned out. Bidra had three cases, and was not turned out. Dhindh had two cases, and Durgapur three, Ghudsisa three. Tanwana had five in 1897, and was not turned out then. The cases occurred in April 1897, and nothing happened till November. Bhadresir had four cases in September and October 1897, and was not turned out. These few cases can perhaps be hardly called epidemics. Rawapur may be said to have had an epidemic, and only the houses surrounding the infected houses were evacuated. This is the only satisfactory case.

13,560. Were they indigenous cases?—Yes.

13,561. They are mentioned in the report?—Yes. They will be found in the return submitted with the Annual Report of 1896–1897. I cannot give the paging, as the information is in the return.*

13,562. Were the villages disinfected afterwards?—Only the houses in which cases had occurred.

13,563. What was the greatest mortality from plague in any one village?—Gundiali was the worst.

13,564. They are all upon the list?—Yes.

13,565. Did you see any plague in monkeys and squirrels?—No; there are tame monkeys in the town, but no wild ones. I have never seen it amongst squirrels, nor have I heard of a case. They say that cats got it, and we found a few dead ones. They say that dogs got it at other places, but we have not found it the case here. It certainly did not take place among dogs.

13,566. Have you any facts to show that cats died of plague?—No, I do not know that they did die of plague. None were examined that I know of. It was conjecture. There were very few seen, and it is, I think, quite as likely that they died of starvation, as all I saw had that appearance.

13,567. Do you think that the effects of the Scotch mists may be due to crowding together of the people in their houses while it lasted?—I do not think so, because it comes on quite suddenly. It is perfectly clear when you go to bed, and in the morning there is a thick mist. Besides, it is not cold and the people do not go inside any more than usual.

* The Report referred to is not reprinted with the Proceedings of the Commission. For the statement referred to, *see* App. No. XLVIII. in this volume.

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13,568. Do the mists come on at night chiefly?—Yes, or rather towards the early morning, and continue till about 8 a.m., when the sun dispels them.

13,569. None during the day?—No.

13,570. How did you diagnose as plague the cases dying rapidly in six hours?—I cannot tell.

13,571. Did you have medical evidence with regard to them?—Yes, Dr. Mason reported them as plague. Also the suddenness of the cases, and in such numbers, pointed to plague.

13,572. You did not diagnose them yourself?—No. I have seen cases where a man has been going about the town and died in a few hours afterwards.

13,573. You say the disease continued long after the people had been turned out in the villages of Muska and Gundiali, though every precaution was taken in the way of boiling clothes, &c., and you came to the conclusion that the continuance of the disease was due to the people visiting their houses; did you turn out everything in the houses?—Yes; everything was taken out of the infected houses, and occasionally they burnt sulphur in some of the villages.

13,574. We have been told in another place that the people put dirty clothes, &c., in a hole in the wall and then bricked the latter up. Do you think that the people were in the habit of hiding things?—No, I do not think so. I have several times been round the villages and found their things outside in the road, while the houses were being disinfected. I have been inside many houses, and never discovered any signs of concealment in the way described. Grain and such things have been allowed to remain in the houses after disinfection of the latter. They have not disinfected grain. I should like to say that there was no disinfection of the gunny bags containing grain. They left the grain in the bags. The things were all taken out when the village was turned out. I do not think in the houses of the traders their belongings were properly disinfected. All the clothes of the people which were taken out this year were boiled in accordance with the suggestion of Government, but that was not done in 1897, but in the latter end of 1898 in the villages. Although orders were given, I doubt if the furniture in the houses was always properly disinfected.

13,575. (*Mr. Cumine.*) In some villages only a few cases occurred and then the disease stopped. In those villages did you take out, at any rate, the patients and the contacts?—Yes, but did not evacuate the village. Wherever there was a case in a house, that house was evacuated. That has always been done, or at least reported to have been done. Whenever I have gone I have found it done.

13,576. Could you give us a sketch of the town, showing in what houses, or at any rate in what streets, the deaths took place that took place in the interval between the two epidemics?—I am afraid that would be very difficult. I could give you all those this year, but in the first epidemic the houses were not marked as they have been this year.

13,577. The deaths that I refer to are the deaths that occurred between the two epidemics. I want to see whether they were occurring in clusters in one part of the town?—I am afraid I could not give that. I can give the streets in which deaths took place from the 20th February to the 9th March 1898, when the first indigenous case inside the town (of the recrudescence of 1898) occurred. From the 20th of February 1898, this information was called for from the Darbar. There were 58 deaths during the above period of 18 days, which is a little over three a day. It will be seen that there were eight deaths in Nawapura, where the first indigenous case occurred on the 9th March 1898. Of these deaths four were infants and one a child of 12. It must be borne in mind that Nawapura is the largest and most congested quarter of the town, The statement is as follows:—

STATEMENT showing the PARTICULARS of DEATHS in MANDVI from other Causes than PLAGUE, from February 20th to March 9th, 1898.

No.	Date.	Caste.	Locality.	Age.	Disease.
1	February 20	Pokurna Brahman	Bundar Gate	40	Consumption.
2	„ 20	Muhammadan Khatri	Machhipit	80	„
3	„ 20	Borah	„ Borat Chok	100	„
4	„ 20	Banniah	Bhuj Gate	19	„
5	„ 21	Girnara Brahman	Bundar Gate	44	„
6	„ 21	Modh Banniah	Nawapura	55	„
7	„ 21	Unknown	On the Bundar	—	———
8	„ 22	Bhatia	Badaiwali Deli	16 days	Erysipelas.
9	„ 22	Bhansali	Nawapura	45	Asthma.
10	„ 23	Turia	Sonawala Gate (outside)	20 days	Erysipelas.
11	„ 24	Hindu	Limbdawali Heveli	56	Chronic nephritis.
12	„ 24	Gusai	New Gate (outside)	68	———
13	„ 24	Padiar (Muhammadan)	Near Sangjibhai's Vakhar	6 months	Dysentery.
14	„ 24	Agaria „	On the Bundar	35	Valvular disease.
15	„ 24	Kureshi „	Salaya	50	Bright's disease.
16	„ 24	Shoemaker	Near Savali Musjid	19	Phthisis.
17	„ 24	Kharwa	Kathiara Street	92	Debility.
18	„ 24	Bhatia	Near the Market	52	Valvular disease of the heart.
19	„ 24	Memon	Outside Sonawala Gate	25	Syphilitic rheumatism.
20	„ 24	Banniah	Nawapura (Town)	12	Salivation and rheumatism.
21	„ 25	Meghwal	Meghwal Vas	60	Diarrhœa.
22	„ 26	Banniah	Nawapura (Town)	60	Asthma.
23	„ 28	Salat	„ „	7 months	Convulsions.
24	„ 28	Pathan	Near Satiwalla Kotha	70	Debility.
25	„ 28	Arab	In Stables (Bundar Gate)	78	Phthisis.
26	March 1	Sarswat	Bhat Seri	2 months	Acute bronchitis.
27	„ 1	Salat	Nawapura	6 „	Diarrhœa.
28	„ 2	Bakali (Muhammadan)	Bakali Wada	1½ years	„
29	„ 2	Meghwal	Meghwal Was	2 days	Acute bronchitis.
30	„ 2	Pokarna	Sajpadi	43	Phthisis.
31	„ 2	Juneja	Salaya	1½	Acute bronchitis.
32	„ 4	Hajjam (barber)	Bandar	25	Diarrhœa.
33	„ 4	Vanja	Near Maharaja's Vandi	9 months	Jaundice.
34	„ 4	Pokarna	In Bhatwali Seri	29	Phthisis.
35	„ 4	Soni	Lowar Chackla	1½	Convulsions.
36	„ 4	Meghwal	Meghwal Vas	1 month	Epithelioma over head.
37	„ 4	Banniah	Mandalia Street	77	Burns.
38	„ 4	„	Near Jagusha's Deli	24	Chronic bronchitis.
39	„ 4	Bakali (gardener)	Navapura	—	Stillborn.
40	„ 4	Gala	Outside Bhangel Naka (Bunder)	2 months	Whooping cough.
41	„ 4	Turia	Sonawala Gate	26	Thrush syphilis.
42	„ 4	Bhansali	Near Luxmi Narayen Temple	9 months	Whooping cough.
43	„ 5	Girana	Salaya	42	Anæmia.
44	„ 5	Lohana	Near Kharwa Mama	1½ months	Whooping cough.
45	„ 5	Kharwa	Salaya	1¾ years	Ulcer of mouth.

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No.	Date.	Caste.	Locality.	Age.	Disease.
46	March 6	Soni	In Moti Padi	2	Acute bronchitis.
47	„ 7	Borah	Machhipit	102	Debility.
48	„ 7	„	„	1 day	Premature birth.
49	„ 7	Mulla	Salaya	2 days	Acute bronchitis.
50	„ 8	Bhatia	Kala Seth Seri	9 months	Diarrhœa.
51	„ 8	Kharwa	Dhunya	21 „	„
52	„ 8	Kayasth	Near Buldevji's Haveli	1½ years	Whooping cough.
53	„ 8	Bhatia	Dhula Falia	15 months	Capillary bronchitis.
54	„ 9	Borah	Machipit	60	Paraplegia.
55	„ 9	Kamagar	In Hajjam Falia	75	Chronic rheumatism.
56	„ 9	Girana	Nawapura	8 months	Diarrhœa.
57	„ 9	Bhatia	Chad Falia	—	Stillborn.
58	„ 9	Arja	Bhuj Gate	76	Hemiplegia left side.

(Witness withdrew.)

Mr. B. J. Damania.

Mr. B. J. DAMANIA called and examined.

13,578. (*Dr. Ruffer.*) You are Chief Medical Officer of the Cutch State?—Yes.

13,579. And you have had some experience of plague in various villages?—Yes.

13,580. In Daisra, Kera, Sarli, Purjao, and Mundra?—I had specially to do with the four first mentioned, not with Mundra, because that rests with the Political Agent.

13,581. The village of Daisra is about 20 miles from Mandvi in a northerly direction?—Yes.

13,582. What is the population?—About 800 or 900.

13,583. What measures did you take before the plague broke out?—We had quarantine regularly put round the people, and we had a system of passes given to those people who wanted to go out of the village into the fields for food, fuel, or such other necessities, with watchers.

13,584. What did you do after the plague appeared?—When plague appeared we had to stop every intercommunication of people, and we put a strong cordon around the infected place; specially the houses infected were evacuated, the patients removed to the Plague Hospital, and the contacts put into segregation camps. Also sanitation and measures of cleanliness were adopted, separate compartments were given to the healthy people in small huts, and the suspected were sent into separate observation camps.

13,585. Were you able to prevent the plague from spreading to neighbouring villages?—Yes, I was.

13,586. How many people formed the cordon round this particular village?—From 15 to 20 altogether.

13,587. You think 20 people were able to prevent people leaving the village?—Yes.

13,588. How many watchers had you on duty at one and the same time?—About 10 or 12 were actually on the work.

13,589. But they could not be at work the whole time; some of them had to rest?—Yes, but we were short of hands, and we had to manage the cordon with them all along.

13,590. How many deaths from plague were there at Daisra?—Of 75 indigenous cases attacked 52 were fatal. The first indigenous case reported was on the 4th September, 1897.

13,591. How had that case been infected?—There was no history actually, but the neighbouring village Kera, which was only about two to three miles off, had been infected with plague, and the people must have come into communication with those of Kera village as well as with Mandvi, because the plague was prevalent there too some time before this.

13,592. When was the last case?—The last case attacked was on the 8th November.

13,593. How many males and how many females were attacked?—28 males to 47 females, of whom there were 19 fatal cases among the males and 33 among the females. The glandular regions affected in them were as follows:—34 femoral, 16 axillary, 14 cervical and nine inguinal.

13,594. Were there any pneumonic cases?—There was one pneumonic case which occurred in the middle of the epidemic.

13,595. Did the pneumonic case occur in a house where there was a bubonic case?—Yes; about 8 people had died in the same family, and among them the above was the pneumonic one.

13,596. Were the bubonic cases in that family taken ill before the pneumonic case or *vice versâ*?—I think they were ill before the pneumonic case.

13,597. How many bubonic cases had there been before the pneumonic case?—I am not certain as to that without referring to the register, &c.

13,598. What measures did you adopt at Kera?—We adopted more or less the same measures as those for Daisra. In Kera the disease had continued for some time.

13,599. What was the population?—About 3,000.

13,600. Did you trace the source of infection of that village?—The infection must have come with Bombay people as well as people from Mandvi, because it is a village with well-to-do people, and they visit Bombay often and come back.

13,601. A great many Bombay people have their homes there?—Yes; the Khojas especially.

13,602. Were you able to trace the first case which actually came into the village?—The first indigenous case was reported on the 27th. I do not know how the infection was actually brought to that village.

13,603. How many cases were there?—139 of which 58 were fatal. There were 57 males and 82 females.

13,604. When was the disease most prevalent in Kera?—About October and November.

13,605. Were there two distinct epidemics in Kera?—Yes.

13,606. When was the disease most marked in the first epidemic?—It commenced about the beginning of April 1897 and lasted till the middle of that month, giving a total of 25 cases.

13,607. When did the second epidemic appear?—In the middle of August. But there were three cases between those two attacks on the 1st or 2nd of June, and the actual epidemic commenced in the middle of August, and lasted till the last week in October.

13,608. What was the percentage of mortality?—It was 71·2. There were 18 cervical, 12 axillary, 12 pectoral, 37 inguinal, and 28 femoral glands affected, with 16 cases of the pneumonic type.

13,609. Did they all die?—I cannot give you the statistics here now without referring to the registers again.

13,610. Did the cases of plague pneumonia occur in groups or were they scattered all over the village?—They were scattered all over the village.

13,611. Did you ever have several cases of plague pneumonia in the same house?—I cannot say; I have not notes of them with me here.

13,612. Have you any facts to show that a case of plague pneumonia may produce bubonic plague in another person?—I cannot say that.

13,613. Do you know of any houses in Kera in which both plague pneumonia and bubonic plague appeared?—No. I cannot say without reference to registers.

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13,614. Is Sarli a small village?—Yes, it has from 75 to 100 inhabitants. The first indigenous case had appeared in this village on the 28th November 1897. We had seven cases and two deaths—three males and four females. One feature of importance in all these villages is that in most of my operations female cases were more numerous than male.

13,615. Are there more females than males in Sarli?—No. They are people who have not to go outside for bread. They generally live on agriculture and field operations. I do not think there would be more females than males.

13,616. Do the young men go to Bombay and other places to earn their living?—No, not in this village. With regard to Kera more males do go to Bombay, and therefore more females are left in the village.

13,617. What glands were affected?—There were three inguinal, two femoral and the others had no glands.

13,618. Were the cases without glands of the septicæmic or pneumonic variety?—Highly feverish.

13,619. Did you have any cases of plague pneumonia?—No.

13,620. What is the population of Purjao?—From 500 to 1,000. The first case had appeared on the 28th August 1898. The poison was imported from Mandvi.

13,621. How do you know that?—Because we had a report as to that. When the attack broke out there we had a report from the Medical Officer there that the case was imported from Mandvi.

13,622. Was it a bubonic or pneumonic case?—It must have been bubonic.

13,623. Were there any pneumonic cases in the village?—I have no statistics as to glands here with me.

13,624. How many males were attacked?—There were 15 males and 19 females, altogether 34 cases with 27 deaths.

13,625. What were the measures taken in these various places?—Immediately on the appearance of plague, if the village was small, the whole village was evacuated and the patients were sent to the Plague Hospital, while the contacts were kept under observation in a separate camp. The healthy people of that village were removed into a health encampment.

13,626. Did you disinfect the belongings of the contacts?—Things of small value belonging to the sick were destroyed and those things which were not destroyed were either boiled or disinfected with carbolic or perchloride of mercury. The best plan I had adopted was to dig up the mud and earth floor up to the depth of about four inches, remove it after disinfection with one of the two lotions, and burn straw or grass over the whole of the dug part or parts.

13,627. Did you scrape the walls also?—Yes. We had the whole building first cleansed, walls scraped, floor dug and burnt, and then washed with quicklime. We got the lime prepared for the purpose quite fresh from the kiln.

13,628. Did you disinfect the town?—After evacuation the whole town was entirely cleansed and the affected houses cleaned and disinfected and then sealed. The sealing was quite necessary up to 1½ months, or two months sometimes.

13,629. What strength of carbolic did you use for disinfecting houses?—About 1 in 40.

13,630. And what strength of sublimate?—Sometimes 1 to 500, and sometimes 1 to 1,000.

13,631. Is not that very poisonous?—We did not have any bad effects, and we were very cautious.

13,632. How did you apply the sublimate?—Generally we had basins filled with water and had to powder the mercury finely, and to boil first with some quantity of water separately, and then mix with the water; it was sometimes very difficult to get it mixed without being boiled first.

13,633. Did you likewise use a syringe?—We had no syringes but threw it about with earthen chatties.

13,634. And the walls?—We had to sprinkle it over the walls with the hand chatties or with pumps.

13,635. Did you get cases of mercurial poisoning among the sweepers?—No, never. We were rather watchful about that.

13,636. How did you prepare the quicklime?—We have hill stones here to be made into lime, and they are burnt down to prepare fresh lime.

13,637. How did you ascertain that your quicklime was caustic?—By throwing it into water it generally breaks open with the effervescence and produces bubbles and gas.

13,638. You made it fresh every time?—Yes.

13,639. You took care to have the lime dry?—I looked to the very dry and fresh quality of the lime.

13,640. How did you apply it?—We made it into a kind of thick water and then washed the places with it.

13,641. How did you apply it to the floors?—Simply with a brush or broom made of cocoa-nut or cocoa-nut-palm tree leaves, and that was applied with the hands.

13,642. Did you boil articles belonging to suspected people?—Yes, we boiled them in Purjao.

13,643. You believe the infected houses in the whole of the affected area should be kept well exposed to the sun, light, and air?—Yes, that is very beneficial, because these people live in most dark, small, ill-ventilated places, so that exposure to sun, light, and air, is the best thing to do.

13,644. How do you think that can be done?—By the removal of the roof-tiles off all the houses which had no well-ventilated openings.

13,645. Was that measure carried out during the rainy weather?—Yes, but if it rained we gave the people permission to close it as soon as the rain fell. We have not had the rains in Punjao.

13,646. Were the people mustered every 24 hours?—Yes, and we had house to house visitation by a medical man to find the sick, if any.

13,647. Did people try to escape on hearing the huts were to be searched?—They did.

13,648. Did they remove their sick to another village?—They did not actually remove them, but they tried to do so in fields and other hiding places in the same village.

13,649. How many men are necessary to form an efficient cordon round a village of 1,000 people?—It dep ends upon the area of the affected village. If they are put into a small area of the village about 10 to 15 people would be quite enough.

13,650. How could 10 or 15 people watch 1,000 people at night?—We generally closed up all the thoroughfares and outlets through which they would have to go, keeping only one or two open, which were watched, and besides we keep a daily muster from the census, and can find out if any one has absented himself.

13,651. Cannot they go across the fields?—No. They fear going because they would be found out on the muster being taken.

13,652. Did you have any system of passes?—Yes, we had passes for the merchants and emergency cases.

13,653. Did that work well?—Yes, especially with village people, because the city people attempt to cheat.

13,654. I understand that there have been cases in the Cutch State in which a person who has recovered from one attack of plague has suffered from a subsequent attack; will you please give us details of such cases with copies of the clinical records of both attacks?—There has been no case on record who has had plague twice in the district assigned to me.

(Witness withdrew.)

Mr. H. S. DEVA called and examined.

13,655. (*Mr. Cumine.*) What is your qualification?—L.M. and S., Bombay University.

13,656. What is the town you have knowledge about?—Porbandar.

13,657. What is the population of Porbandar?—18,075. It has both a port and a railway station. In 1893, when the plague was first heard of in Bombay, a medical examination was started for persons arriving from Bombay, both by sea and by land.

13,658. Subsequently, was this medical examination replaced by detention for 10 days under observation?—Yes, at the beginning of February, 1897.

13,659. Who examined the passengers?—A Hospital Assistant specially appointed for the purpose.

13,660. Did you also disinfect their clothing?—Yes.

13,661. How many cases of plague were detected among them?—We had two seasons. On the first occasion there were 11 imported cases in the quarantine camp, of which seven proved fatal. In the second, which was in 1897-98, 4,500 persons passed through quarantine, of whom three persons developed plague, and two died.

13,662. Can you tell us what the period of incubation was in each case?—Out of those 14 cases there was one case which developed plague symptoms on the ninth day after leaving the infected port of Bombay. The second case occurred on the sixth day, and the other cases were below five days.

13,663. Can you tell us how many days after arrival it was that they developed plague in your camp?—Eight days was the longest period; the second case was five days, and the rest below five days.

13,664. On what date did you discover an indigenous case of plague in Porbandar?—The first case was on the 17th May, 1898 amongst the Kharwa community (sailors).

13,665. In what part of the town did they live?—To the west, just by the side of the creek, near the bandar. It is not a walled town. The Kharwas are sailors and fishermen, and the women are labourers in the town.

13,666. Do they unload the boats?—The women especially unload the boats.

13,667. How many cases did you find when you first found indigenous plague?—I only found one case on the 17th May. That was a woman.

13,668. How many deaths had occurred from the 1st May to the 17th of May amongst those Kharwas?—Out of 42 deaths in the town there were 23 among the Kharwa community alone, of whom 17 were women, three male children and three female children, and no adult males.

13,669. Did you make any attempt to find out whether the crews which had come from Bombay had been plague infected?—I did make such an attempt and found that no one had suffered from plague from the 1st May to the 17th May.

13,670. How could you trace them?—I got a list of the country craft from the Port Superintendent's office. Then I found out the owners and got the names of the persons who had been in their service in those crafts.

13,671. Were those Kharwas taken out of the town to a place across the creek?—Yes, on the 20th May. The whole Kharwa community was taken out within a few hours. They were supplied with materials, and they built their own houses. Altogether, 3,500 people went out.

13,672. Were they put under guard?—Yes, a guard of 18 persons. There was a creek in the way.

13,673. Was their clothing disinfected?—Yes, twice a week. When they first went out their clothing was not disinfected, but it was done the next day, and subsequently it was done twice a week. That was continued for two weeks.

13,674. Were they allowed to return to the town to work during the day?—No. They were fed by the State entirely, at a cost of about Rs. 250 a day.

13,675. Were the houses of the plague cases that occurred disinfected with perchloride of mercury?—Yes, and all the houses were cleaned generally.

13,676. How long did the cases go on among these Kharwas after evacuation?—The last case which occurred after evacuation was on the 27th May.

13,677. Can you give us the daily attacks from the date of evacuation to the 28th May?—They are as follows:—

STATEMENT showing DAILY ATTACKS and DEATHS, from the DATE of EVACUATION to the 28th May.

Date.	Attacks.	Deaths.
May 20th	3	2
„ 21st	5	2
„ 22nd	4	1
„ 23rd	14	9
„ 24th	4	7
„ 25th	4	2
„ 26th	3	3
„ 27th	2	1
„ 28th	0	0

13,678. How long did these Kharwas remain out in camp?—Till the 11th June, and then, on account of the monsoon coming on suddenly, they were allowed to go back to the town. Then for three days they remained perfectly free. The Kharwa quarter was divided into three parts, and each part was kept in charge of a Hospital Assistant, who went round each of the houses morning and evening, with two leaders of the Kharwa community. There was not a single case for three days after their going back into the town. The first case occurred on the 13th June, the second on the 15th. There were four cases on the 16th, and six cases on the 17th.

13,679. Did these cases occur in houses in which there had been deaths in May?—The first did not, but subsequently a few cases occurred in the houses which had been disinfected where there had been cases before.

13,680. Did other communities begin to get infected also?—Yes. The Bhois and the Borahs. They lived in quarters adjoining the Kharwas.

13,681. Did you have any evacuation?—Yes; those communities were evacuated and the Kharwas also. The persons living in the quarter most affected were segregated in country craft which were moored in the creek.

13,682. How many persons?—About 1,500.

13,683. How many Bhois?—400.

13,684. Where were the Bhois taken?—To a temple called Chadshavar, and a spacious building belonging to the Bhois situated outside the town.

13,685. And the Borahs?—They numbered about 150 and were taken to outhouses attached to the new jail, which was under construction then.

13,686. Were the people comprised in these three evacuations—the second evacuation of the Kharwas and the evacuation of the Bhois and the Borahs—allowed to go back daily to the town for their work?—Yes, in the second evacuation.

13,687. Did you disinfect their clothes before turning them out?—Yes, their clothes were disinfected.

13,688. Had you any roll call for them?—Yes, for all. In the case of the Kharwas it was called daily; in the other communities it was called every alternate day.

13,689. One thousand five hundred of the Kharwas were taken out in the country craft?—Yes.

13,690. Did you subsequently evacuate the whole of the rest of the Kharwas?—Yes, also the Kharwas who were in the country craft. In the meantime huts had been built on the other side of the creek to accommodate the whole of them, and when we were ready the whole community was removed. That was on the 8th July.

13,691. Can you give us any figures to show the result of evacuation amongst these three sets of people—the Kharwas, the Bhois, and the Borahs?—There are no particular figures, but the monthly statement of cases in different communities shows that after evacuation the cases began to decline in those particular communities.

13,692. Will you put the monthly statement in?—Yes. It is as follows:—

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STATEMENT showing PLAGUE CASES and DEATHS that occurred among various COMMUNITIES in PORBANDAR from the month of May (the time of outbreak) 1898 to the end of November 1898.

Months.	Muhammadans.		Kharwas.		Bhois.		Luvana.		Brahman.		Banniahs.		Other Hindus.		Parsees.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
May - -	5	5	34	20	0	0	2	1	0	0	0	0	0	0	3	2
June - -	1	1	72	48	12	6	4	5	1	1	0	0	0	0	0	0
July - -	6	4	15	12	4	4	13	10	2	2	3	2	8	7	0	0
August - -	72	56	2	3	6	9	18	16	30	27	11	7	37	28	0	0
September -	16	11	0	0	1	1	8	7	5	4	3	2	33	28	1	1
October - -	8	7	0	0	0	0	1	0	3	3	2	2	19	13	0	0
November -	0	0	0	0	0	0	2	1	0	0	0	0	2	1	0	0
Total - -	108	84	123	83	23	20	48	40	41	37	19	13	99	77	4	3

Total number of plague cases - - - - 465
,, ,, ,, deaths - - - - 357

13,693. Was there any house-to-house search among these evacuated communities?—Yes, it was done every day.

13,694. Were the sick removed to hospital?—Invariably, and the contacts were removed to contact camps.

13,695. While those evacuated communities were outside the town, was the disease spreading within the town itself?—Yes.

13,696. Was it spreading from a centre gradually outwards?—Yes, from west to east; that is, from the crowded localities to the less crowded localities.

13,697. Throughout the epidemic did you find one part of the town affected more than another?—Yes, mostly the crowded parts. The west side was more affected.

13,698. Did the disease, as it spread within the town, appear to be carried by human beings, or to extend to houses on either side or behind?—It extended more to the houses behind, or to the houses on either side, than by human agency.

13,699. Did you observe dead rats?—Yes, before we discovered cases in quarters other than the Khawa quarter, but we observed dead mice more than dead rats.

13,700. Did the death of mice appear to precede cases of human beings or *vice versâ*?—In two localities, at any rate, the death of mice was reported to me a week before a human case occurred. This cannot be said of other localities. In other localities the death of a human being was heard of before dead mice were seen.

13,701. Were there many rats in the town?—I think there were fewer rats.

13,702. When, in your house-to-house searches, you found a plague case in the town, what did you do?—The plague cases were removed to hospitals. We had 11 hospitals, some of which were started by private persons. The contacts were removed to contact camps. The buildings attached to the Jundeshwar, Mahadeo, and Becharaji Mats served as contact camps for the Hindus, and the Somraj-pir Takia was reserved for Muhammadans.

13,703. Did you generally find contacts?—My impression is that some of the inmates left the house before we learned of the case, or before they gave us information about the case.

13,704. Did you find that the contacts flying in this manner tended to spread the disease?—I do not think so.

13,705. Which were the communities which now began to be affected in the town?—The Muhammadans, the Turias, the Julahas, the Sepoys, and the Memons.

13,706. Did you try evacuation again?—For some days we could not do it as the rainy season was on, but after the rainy season was declining we had huts built for them, and evacuated all the different communities; in fact, half the western portion of the town was evacuated.

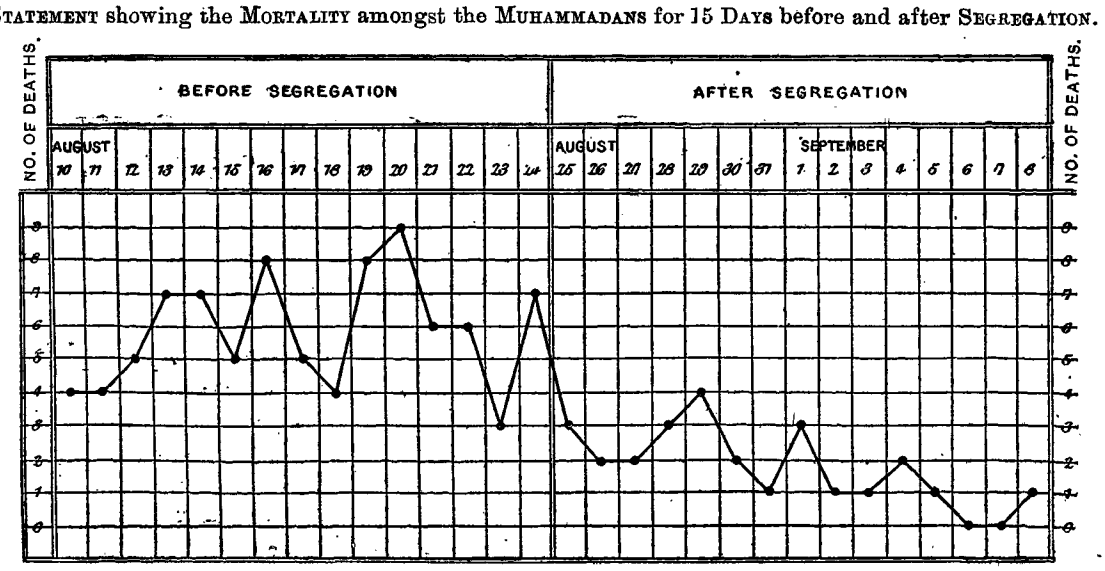
13,707. How long did it take?—Evacuation commenced on the 23rd August, and was completed before the 6th September.

13,708. Can you give us figures showing the good effect of this?—Yes. The evacuation of the Muhammadans was completed on the 6th of September. Practically the community became quite free after that, as will be seen from the table annexed:—

Date.	Turias.		Julahas.		Sepoys.		Memons.		Muhammadans.	
	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.
Sept. 6 -	—	—	—	—	—	—	—	—	—	—
,, 7 -	—	—	—	—	—	—	—	—	—	—
,, 8 -	—	—	—	—	—	—	—	—	—	—
,, 9 -	—	—	—	—	—	—	—	—	—	—
,, 10 -	—	—	—	—	—	—	1	—	1	—
,, 11 -	—	—	—	—	—	—	—	—	—	—
,, 12 -	—	—	—	—	—	—	—	—	—	—
,, 13 -	—	—	—	—	—	—	1	1	—	1
,, 14 -	—	—	—	—	—	—	—	—	—	—
,, 15 -	—	—	—	—	—	—	—	—	—	—
,, 16 -	—	—	—	—	—	—	—	—	—	—
,, 17 -	—	—	—	—	—	—	—	—	—	—
,, 18 -	—	—	—	—	—	—	—	—	—	—
,, 19 -	—	—	—	—	1	1	—	—	1	1
,, 20 -	—	—	—	—	—	—	—	—	—	—

The effect of the evacuation of the Muhammadans is clearly shown in the chart below:—

STATEMENT showing the MORTALITY amongst the MUHAMMADANS for 15 DAYS before and after SEGREGATION.


NO. OF DEATHS.
BEFORE SEGREGATION
AFTER SEGREGATION
AUGUST
SEPTEMBER
10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31 1 2 3 4 5 6 7 8
NO. OF DEATHS.

13,709. Were the houses of the evacuated people locked up?—They were first disinfected and then locked up. We took steps to keep them open for a few hours every day, and with this object in view one person in each house was allowed to go into the town, and keep the house open for a couple of hours. Even in the case of the Kharwas this was done. No pass was required when the houses were to be opened for those two hours. Everybody was allowed to open his own house. After the two hours nobody's house was to be opened without a pass, and passes were given very sparingly.

13,710. How did you find out whether the people were sleeping secretly in their houses or not?—There was a strict police guard, and no house was allowed to be opened at night on any account. No passes were given, and there has been no breach of this so far as I know.

13,711. Did you disinfect the clothing of these last evacuated Musalmans when you took them into camp?—No.

13,712. Did any bad effects result from that?—No.

13,713. You had three kinds of camps, the hospital camp, the contact or segregation camp, and the health camp?—Yes.

13,714. When a case of plague occurred in your health camp, did you find it spread to other people in the camp?—No, it did not.

13,715. What was the date of the last case of the epidemic —The 8th of November.

13,716. Was that in the town or in the camps?—In the town.

13,717. When did you allow the whole of the people to return to their houses?—On different dates in the month of November. By the end of November everybody from the health camp was in the town.

13,718. Before the people began to return, what was the number of people remaining in the town?—About 5,000 in the town and 6,000 in the camps.

13,719. Throughout the epidemic generally the only houses which you treated with perchloride of mercury were those in which deaths had occurred?—Yes, all in which plague cases were discovered.

13,720. Can you give us the figures of the total attacks and deaths throughout the epidemic according to ages, castes, and sex, with the figures for the hospitals?—Yes.*

13,721. Can you tell me the period of incubation in the contact camps?—I have not the figures. There was not a case after the sixth day. In the segregation camp there were only a few.

13,722. Can you say how many?—I have not the figures. I will give you those figures. (NOTE.—The figures supplied later by witness were the following:—

STATEMENT showing NUMBER of CASES of PLAGUE that were discovered in CONTACT CAMPS.

No. of Cases.	Date of Admission in the Camp.	Date of Attack.	Name of the Camp.
	1898.	1898.	
1	20 June -	25 June -	Jundeshwar Camp.
1	4 August	11 August	Do.
1	22 June -	28 June -	Becharaji Camp.
1	1 July -	4 July -	Do.
1	30 June -	5 July -	Do.

13,723. Can you tell us to what extent hospital attendants were attacked?—Not one was attacked.

13,724. Did you allow families to go with their sick patients to the hospital?—No, only one relative of the sick, and, in some cases, two were allowed to go. The others were taken to the contact camps. They were generally near the hospitals.

13,725. Can you tell us to what extent plague developed among the relatives attending on sick people?—Only two cases.

13,726. Do you think those relatives could have got infected, not from the sick person, but from the same source of infection as the sick person?—Yes. They must have been in the incubation period when they came to attend upon the sick.

13,727. How many of your cases were bubonic and how many pneumonic?—Only six cases treated in hospital were pneumonic.

13,728. Have you any instances of a man having plague more than once?—No.

13,729. Have you any instance where a person who was taken ill in a camp clearly got his infection from visiting his house in the town?—We had many instances to that effect.

13,730. Did you ever try corpse inspection as a means of finding out who died of plague?—Yes. From the 13th March 1898 we have had a system of death certificates. Before the breaking out of plague in Bombay our mortality returns were incorrect, but since then special precautions have been taken to keep them correct. Up to the 13th of March 1898 I am quite sure, though the cause of death may have been wrongly returned, the figures as to the number of deaths are quite correct. From the 13th March 1898 we have insisted upon the examination of corpses, but the examination of Muhammadan females was objected to. Invariably all the Hindus were seen and the Muhammadan males. When the plague was raging we had a nurse to examine the Muhammadan females. After the disappearance of plague in Porbandar we ceased insisting upon the examination of females.

13,731. What are your present measures for preventing plague getting again into Porbandar?—We have imposed no quarantine now. The persons coming from distant places by rail or from any places by sea are given passes, and they have to submit themselves for examination for 10 days after going to Porbandar. We found that only 5 per cent. of those whom passes had been given absented themselves from examination.

13,732. Have you had experience of plague in any village near Porbandar?—Yes, Vadala.

13,733. How was it infected?—It is situated on the extreme boundary of our territory, just near the Jamnagar territory. There were some villages which were affected near that village. Some 12 days before the case occurred there, some persons came from one of those villages and stayed there for a day only. Subsequently to this, I could not make out if anyone else had come before the case occurred.

13,734. How many cases occurred in Vadala?—Before I went there there were two suspicious cases. I, myself, saw one case, and that was a real case of plague.

13,735. Were they all in one community?—Yes, all three belonged to the Luvana community.

13,736. What did you do to the community?—The whole community, consisting of about 50 persons, was segregated in huts buts built for the purpose outside the village.

13,737. How many cases occurred amongst them in segregation?—Not one.

13,738. How many cases occurred in the village?—None.

13,739. How long did you keep the community out?—A month and a-half.

13,740. When did you let them back?—Only recently, in the month of December.

13,741. In the statement of daily attacks and deaths, which you have put in, is there anything to which you wish to draw our attention as showing that the virus of plague gets weaker towards the end of the epidemic?—I have noticed that it does get weaker towards the end of the epidemic, and the figures in that statement will show that.

13,742. (*Dr. Ruffer.*) You said the relatives who got plague in the hospital must have been in the incubation period when they entered the hospital; why do you think so?—Because none of the hospital servants got it. That is one point. Then the relatives came from the same place where the sick person came from. If there had been any cases among the hospital servants, that would be some reason to believe that the relatives got it in the hospital, but that was not so. It is simply my conjecture that they were in the incubation stage when they arrived.

* *See* Appendix No. XLIX. in this Volume.

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13,743. Can you tell me how long after coming to the hospital the relatives got the plague?—Within six days in both cases.

13,744. What is the incubation period of plague, in your opinion?—Not more than nine days.

13,745. Why do you think so?—By the observations we have made in our quarantine camps.

13,746. Did you disinfect the people before they went into the quarantine camps?—Yes, they were disinfected.

13,747. Did any of them get plague under nine days?—All those that developed plague had it within nine days after admission in the quarantine camp.

13,748. Were the people disinfected when they went into camp? Was their clothing disinfected?—Not in the case of the Muhammadan community; in the case of the others they were disinfected. I refer to the health camps. In the case of the quarantine camps, everyone was disinfected before being allowed to enter the camps.

(Witness withdrew.)

(Adjourned till Wednesday, February 1st, at Ahmedabad.)

At The Collector's Office, Ahmedabad.

THIRTY-NINTH DAY.

Wednesday, 1st February 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LLD., F.R.S. (*President*).

Mr. A. CUMINE. | Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Mr. H. F. Silcock, I.C.S.
1 Feb. 1899.

Mr. H. F. SILCOCK, I.C.S., called and examined.

13,749. (*The President.*) You are the Commissioner for the Northern Division of the Bombay Presidency?—Yes.

13,750. Have you had experience of plague measures in the Nasik District?—Yes, during part of 1897 and 1898.

13,751. You had experience with regard to complete evacuation?—We had partial evacuation first at Nasik city, because we thought we could control the plague by that means. It is a large city, with a large floating population. The first indigenous case we had in Nasik was I think on the 16th of October, 1897, and we evacuated, of course, all the part affected, but, as we found that it was still moving along to a further extent in the city, we went on further evacuating. Then we found it still creeping along, so we evacuated the city by wards thinking that we should still be able to control it, until, practically speaking the whole of the city, or three-fourths of it, had to be completely evacuated. As to the remaining portion of the town, there were only one or two cases, and we disinfected in connection with them. That was my first experience of partial evacuation.

13,752. What is the population of Nasik?—Its permanent population is between 25,000 and 26,000, but it is a great centre of pilgrimage—almost as much as in any part of India—and in consequence there is a tremendous floating population always.

13,753. At the time of the epidemic, was it the permanent population that you were dealing with chiefly, or were you dealing also with a part of the floating population?—The first indigenous case was in the permanent population.

13,754. Did all the inhabitants of Nasik at that time consist of the permanent population?—It would be quite impossible to say that, because from one end of the year to the other people are constantly coming backwards and forwards.

13,755. That was the minimum population?—Yes.

13,756. How was the plague introduced into Nasik?—It is believed from Ghoti—another village that was infected from Bombay. The first man to be attacked was a Muhammadan dealer in rice. Ghoti village is the great centre of the rice trade. Ghoti has been badly infected from Bombay, and people from Ghoti came in with plague on them, for I think six weeks before, but the disease did not break out indigenously in Nasik for all that time.

13,757. The first case was reported from this village which itself had become infected from Bombay?—Yes.

13,758. Had you early information of the first cases?—We have had imported cases in Nasik from 1896. I started railway inspection in the beginning of October 1896, and we had frequently cases from Bombay—Banniahs and other parties from the grain quarter. We had any number of imported cases, but no indigenous cases.

13,759. I am talking of the first infection of the town; that must have been by imported cases?—Yes.

13,760. When did the introduction of the disease into Nasik occur?—I should say that took place in the middle of October 1896, but those were imported cases.

13,761. Did you get early information of these first cases which came in?—We always got it sufficiently early to be able to get them out within perhaps half-a-day after coming there.

13,762. What do you mean by sufficiently early?—Within half-a-day.

13,763. What did you do with these cases?—We took them away to the plague camp.

13,764. You had already prepared a plague camp?—Yes, close to the Nasik Road railway station.

13,765. What did you do with the dwellings of the people removed to the plague camp?—The dwellings of these people were unroofed and disinfected.

13,766. Were there any houses near them?—No.

13,767. At about what period did plague become indigenous in Nasik?—About a year later.

13,768. Then you took such measures as you have just described, that is to say, in addition to emptying the house in which plague was found, you also emptied

certain houses in the surrounding area?—We evacuated all the surrounding area. We disinfected three houses on either side, and six houses on the opposite side.

13,769. You found that was not sufficient?—No.

13,770. You therefore took up another area and treated it in the same way?—Yes.

13,771. You went on in that way until practically three-fourths of the city were evacuated?—Three-fourths were fully evacuated with the exception of the part on the other side of the river.

13,772. What happened after those three-fourths had been evacuated?—The disease gradually died out and we proceeded with disinfecting and cleaning; the city was deserted, except the part on the other side of the river.

13,773. You have another example in the case of Malegaon?—Yes.

13,774. What were the facts there?—Malegaon had a few cases in November, 1897; that also was infected from Bombay. A refugee from Bombay managed to pass through and infected two people in a certain block. They died, and the blocks were turned out. All the people in them were turned out and the whole of the blocks thoroughly disinfected and whitewashed. They were kept out of it, I think, for 14 days. I was not there at the time; I only know it from the report of my Assistant and the Deputy Sanitary Commissioner. After a time the disease stopped, and these people were allowed to go back. About three weeks later, from some unknown reason, except that it was suspected that the cases were also Bombay refugees, the disease broke out again, not in one place, but in spots all over the the town. By the beginning of January it was obtaining rather abnormal proportions, and I went up there myself then and saw that there was really nothing to do but to evacuate, because it was not in one place, and that the whole town must go out. We made arrangements accordingly and evacuated the whole town.

13,775. You commenced this entire evacuation in January?—Yes, and we finished it in about a fortnight. There was not a case, I think, in a month after that in the evacuated village.

13,776. What is the population of this town?—18,000.

13,777. Therefore, you evacuated 18,000 people in about a fortnight?—Yes. A good many of the better class, of course, went out on their own accord. We took out all the poor weavers and labourers and others—about 8,000—and put them into a health camp. We took their looms out also so that they could still go on with their work in this health camp. Then there were a certain number who preferred to make their own arrangements on approved sites, and they were allowed to do it. We knew them and had a list made of them and kept them under supervision. The public health camp had about from 6,000 to 8,000 people, and we kept it under thorough supervision by our Staff Corps officer and medical men and others who took the roll call twice a day.

13,778. I understand you actually dealt with from 6,000 to 8,000 people?—Yes, in this one camp we made ourselves. We dealt with practically the whole population.

13,779. I thought you said they went out voluntarily?—They made their own arrangements, but we knew where they were in the camps.

13,780. Therefore, you actually provided accommodation for, and removed, between 6,000 and 8,000 people in a fortnight?—Yes.

13,781. In what way were the evacuated houses treated?—They were dealt with in the same way as at Nasik — disinfected, opened up, and all rubbish destroyed and burnt.

13,782. Was it a very congested area in both of these towns that was mainly affected?—Nasik was very congested.

13,783. And the other town?—Malegaon being so much poorer the houses were not of the same size. A great many of them were small houses with only a ground floor.

13,784. Were the small houses very close to each other?—Very close—chawls.

13,785. The congestion was great taking into account that the houses only had one floor?—I could not say what the area was, but they were very crowded houses, because it is the tendency of the people to crowd. They were all up-country people—weavers, and others.

13,786. What was the general character of the houses?—It is very hard to give you a type of it, but supposing you take it as about one half the size of this room, with only one door and no window. The door lets in all the light and air there is during the day, and it is closed at night. There would probably be about six or eight people living in it.

13,787. There is no means of light access or of ventilation when the door is closed?—Practically none, the door gives a certain amount.

13,788. What is the kind of floor generally?—Ordinary earth, and probably cow dunged—it may be, if they are well-to-do.

13,789. Are you speaking now of both of these towns or only one of them?—There are the lower class type of houses in both the towns, but, of course, in Nasik we had tremendous houses, which are used more or less as caravansaries or hotels for the pilgrims.

13,790. Have you had any experience with regard to partial evacuation?—At Sinnar partial evacuation was tried, not by myself, but by some of my Assistants. I found that it was not acting satisfactorily, and I went down and ordered the evacuation of the whole town.

13,791. How large is this town?—It is a town, I think, of about 8,000 only.

13,792. Within what time was the evacuation effected?—I think I evacuated it in about a week. It had, of course, been gradually evacuated before I went down. It was a place where a serious riot had taken place, so I went down there myself, and I found that the disease was still prevailing, and that the partial measures that had been insisted on before were not acted up to, and I turned out all the houses, whether infected or not.

13,793. Therefore, generally speaking, you found partial evacuation inefficacious?—That was my experience.

13,794. Are there any instances in your experience which would lead you to suppose that partial evacuation might be successful?—I think if you get the earliest information of a case that, possibly, partial evacuation would be.

13,795. Have you any example that you can give us in that direction?—Only of what I would call imported cases. I have known several of these cases where partial evacuation was all that was required. Those imported cases were known at once, because intimation was given of them, and they had come from other villages which were infected. The houses concerned were disinfected and cleaned out, the people were segregated, and no other cases occurred. I have known three or four instances of that in villages.

13,796. I think you can give us the case of a village called Lassalgaon, which exemplified what you have just said?—Yes, peculiarly so, because it is a large trading village close to Bombay, so that it was constantly exposed to infection.

13,797. You were successful in getting sufficiently early information there?—Yes, during my time.

13,798. What was your machinery for getting this early intimation?—We get information by the village officers who had got their orders that all strangers were to be observed; a watch was kept on the railway station, and all strangers who came into the town were kept under observation. If anyone was found ill, intimation was at once sent to the nearest Government officer, and the Medical Officer inspected him.

13,799. What did this observation consist of?—At that place the system of observation was practically a voluntary one, carried out by the people themselves, who were so anxious to keep the plague out, combined with the village staff, the Patel and the Kulkarni, or village accountant.

13,800. Do you know how often a person arriving ill would be seen, and his condition reported to the officials?—I could not say.

13,801. Have you had much difficulty in preventing people from returning to evacuated houses?—Yes, always; sometimes it was impossible to prevent them.

13,802. What means did you adopt to reduce that danger?—We tried it by police patrols, and keeping guards over their houses in the streets. That was all that we could do.

Mr. H. F. Sikock I.C.S.

1 Feb. 1899.

13,803. In the case of Malegaon with 18,000 inhabitants, what would be the number of persons required to act as a patrol cordon?—In Malegaon it was particularly few, because we fortunately had the assistance of a wing of a Native Regiment that was stationed there; they were lent to us.

13,804. Including those men, how many altogether?—I could not say the number, but it was much less necessarily than in other places, because the natives fear soldiers much more than a policeman.

13,805. One soldier went further than one policeman?—Much further; in fact they did not attempt to go in much in Malegaon.

13,806. Did they succeed in other places?—They did in Nasik.

13,807. With what result?—Unfortunately we can only attribute the constant dropping cases of plague out in the camps to their going into these houses there.

13,808. Do you mean merely going into the house, or staying in the house?—They have gone in there and slept there. Instances have been reported to me where they have been found sleeping in a house that was evacuated.

13,809. Do you know any cases in which evacuated persons going back to the town, and following their occupations, acquired plague thereby?—No; I have generally found I could safely let them go and do their work during the day, as long as I did not allow them to stop and cook in the house.

13,810. You said sleep also?—Yes, I did not allow them to sleep, but they might open their shops and do their ordinary work, and carry on their trades as black smiths, or shoemakers, or anything else. I found that any harm never accrued from that.

13,811. The shops you refer to are open bazar-like shops?—Yes.

13,812. On the other hand, when a house was shut up at night, and they remained there, you found that infection accrued?—We found, from evidence, that they had been in these houses, and, as they got plague afterwards, they must have got it from sleeping and remaining in the house at night.

13,813. When they do sleep in their houses they sleep on the floor, do they not?—Nearly always.

13,814. You have a case, I think, which seems to show that, apart from the grain itself being infected, a place in which grain is stored may have conveyed infection to a person?—Yes, there is one case that I inquired into at Trimbak. That is a very sacred town, and this was the granary attached to the temple. The whole temple had been evacuated, and all the surroundings, excepting two or three people who were obliged to be kept there for temple service, but they were not allowed to sleep anywhere but in the open or on charpoys. The granary and other places, where the temple jewellery and stores were kept, were locked up. The key was left with the manager of the temple out in his camp. The people had been out for some ten or twelve days, and they were perfectly free; no cases had occurred among them at all. Suddenly we found two cases in that camp. We could not find out how it was till inquiry was made, and we found that they had gone in the previous evening and taken away stores of grain out of the temple granary into the camp. Those two cases were the only two attacked, so that I take it the grain had nothing to do with it, because no cases occurred among the other people who were eating the grain. The two who had gone in suffered, while the people who had eaten the grain, but who did not go into the place, did not suffer at all. Another thing is that they were not allowed to go into that place with shoes on, so that they had to go in bare-footed.

13,815. How do you think plague virus is carried from place to place; have you had any experience about that?—I can give you one case, but it is only just in passing. It was a peculiar case and I merely state it for what it is worth. It was a case where plague was apparently wind-borne. My own experience is that it does not follow any one course. In the case of Nasik it went exactly against the wind.

13,816. What is the case in which apparently it was carried by the wind?—I have no theory on it; I only mention it because there was one camp on the leeward side of the village which was infected. Three other camps which were not on the leeward side were not infected. After the people had gone out into camp the cases among them had ceased, but this one camp still kept on. I had this camp removed to another site, though still to the leeward, but the disease continued, and, as a last resource, I had it removed completely from the leeward to the windward side of the village, which was free from plague, and the disease abated. That is the only reason I have for thinking that the wind had anything to do with it, and I only give it as a peculiar incident for what it is worth.

13,817. Had you had much infection of rats in any of these districts?—Very little.

13,818. Not enough to allow you to suppose that they are important agents in the carriage of disease?—I can only think of one case before it broke out indigenously in Nasik. About 50 yards away from the first house infected two rats were found dead one morning, and it was reported to me, but what they had died from I do not know.

13,819. Are there any other means by which persons might have become infected?—Yes, quite so; but mortality among rats was not an incident of plague in Nasik.

13,820. Had you any other animals infected?—No, none at all.

13,821. (*Dr. Ruffer.*) Could you tell me how many cases of plague you had in Nasik, before the town was evacuated?—I have not been able to get details. Mr. Stewart, the Secretary to Government, who was actually the Chief Plague Authority, will be able to give you those.

13,822. After evacuation, when did the plague stop?—The last case was about the middle or the end of February, 1898.

13,823. About a month after turning out the people?—Yes, about a month after the last were turned out.

13,824. When were the inhabitants allowed to return to Nasik?—I kept them out as long as possible. I let them go back by wards, and I think the last were allowed to go back at the end of April. It was only my personal influence that kept them out, because the longer they stayed out I thought the better it would be for them. It was hot weather and I told them they had better stay, and they stayed out. In Malegaon on the contrary they were allowed to go back in a month after the last case, and there was no case afterwards.

13,825. Were the people watched and counted in the camps?—Afterwards, not at first, at Nasik. In Malegaon they were watched; it was a smaller town.

13,826. Where did you bury or burn the dead bodies—in the camp itself?—In the general burning or burial ground, after inspection.

13,827. Is there a watch at the burial ground?—Yes.

13,828. So that you knew exactly what the mortality was?—Yes.

13,829. Do you think many people ran away from the camps?—I should fancy they did at the beginning.

13,830. How many?—I could not say.

13,831. Do you think a large proportion or only a few?—At the beginning I know they must have run away from the Nasik camps, but they did not when we got them under proper supervision. It was our first experience, and our measures naturally were not as complete as they afterwards became.

13,832. How many do you think ran away to other villages—1,000 or 2,000?—I should say fully about 5,000 went to other villages, where they had got lands and friends, but this was before the disease got at all virulent.

13,833. Do you think they ran away to neighbouring villages on account of the fear of the plague, or on account of the plague measures?—A good deal on account of the dread of segregation which they did not understand.

13,834. You said that two men went to a place where grain had been stored, and got the plague. I think you said in your evidence that they had been there the evening previous to the attack?—We heard in the morning that there was plague in the camp in question, and on inquiry we were informed that the previous evening they had gone in, it might have been in the night, I do not know which.

13,835. Are you sure that they may not have gone to the grain store previously?—Possibly.

13,836. If they got the plague by going to the grain store the previous evening, the incubation period must

have been less than 24 hours?—The disease may have been in them; but that is all that we could trace. They had been out for 10 days.

13,837. Can you exclude the possibility of their having been infected at some previous time?—No.

13,838. (*The President.*) What do you mean by infected at some previous time?—We only know that they had been in this place, and taken grain out, and we concluded from that that they must have contracted plague from this granary. Of course, that was only the opinion that we formed.

13,839. (*Dr. Ruffer.*) There was no proof that they got the plague there?—No.

13,840. (*The President.*) Had they been permitted to go to this granary?—Not this time.

13,841. They evaded the cordon?—That granary being the granary of a very sacred temple, we trusted to the manager of the temple, who locked it up, to see that no people went into it without authority. He evidently allowed these people to go in, as we found out, and then we sealed it up in order to prevent a similar thing occurring again.

13,842. In the case of Malegaon, did you find that many people who left that town went into neighbouring uninfected villages?—Not in the case of Malegaon,

13,843. None?—There were two cases only, I think, that were found.

13,844. Those cases were easily traced?—Yes, because they got the plague, and they were discovered and the houses disinfected, and no other cases happened there.

13,845. How did you explain the much smaller number of plague cases in Malegaon as contrasted with Nasik?—Because Malegaon became infected between two or three months after the Nasik measures were introduced. The people were beginning to get accustomed to them; they saw what the measures were, and they had lost a great deal of their fear. Another thing was that we had got the villages into much better order, and our strict orders were that the neighbouring villages were not to allow the Malegaon people to come into their villages, and they refused to allow them to do so.

13,846. These people were no longer afraid?—They were no longer afraid of segregation, or of going into camp.

13,847. Your arrangements also were more perfect?—Yes.

13,848. I suppose you could now adopt those arrangements elsewhere at once, in the same complete form?—I think in a rather better form.

Mr. H. F. Silcock, I.C.S.

1 Feb. 1899.

(Witness withdrew.)

Lieut.-Colonel M. L. Bartholomeusz, I.M.S., called and examined.

Lieut.-Col. M. L. Bartholomeusz, I.M.S.

13,849. (*The President.*) You are Civil Surgeon here, I believe?—Yes.

13,850. In the Indian Medical Service?—Yes.

13,851. What are your medical qualifications?—I am a Bachelor of Medicine and a Master of Surgery of the Edinburgh University.

13,852. (*Dr. Ruffer.*) When was the first case of plague detected in Ahmedabad?—About the 3rd of October 1896.

13,853. How many cases were detected?—There were three cases to begin with.

13,854. Did you discover them?—They were first seen by Assistant Surgeon S. F. Gandhy, the Medical Officer of the Ranchodlal Charitable Dispensaries.

13,855. One of these cases came from Bombay, did it not?—Yes, and the other two cases were Ahmedabad residents employed in the railway goods yard.

13,856. These people had come into communication with Bombay passengers?—Yes.

13,857. Were they typical cases of plague?—Yes, they were typical cases of plague.

13,858. On what did you base your diagnosis of plague?—On buboes on the groin, chiefly, and fever.

13,859. What became of these cases?—Two of them died, and one recovered.

13,860. Were the two fatal cases bubonic ones?—Yes.

13,861. Was the imported case a bubonic case?—Yes.

13,862. What evidence have you to show that these two cases caught the disease from the first case; were they living in the same house?—No. I do not think they got it from the first case.

13,863. How do you think they got it?—I think they got it from coming in contact with the goods which came from Bombay.

13,864. What precautions did you adopt in the infected houses?—It was at the beginning of the epidemic, and, consequently, we simply opened all the doors, and let in light and air. We fumigated the place, and, of course, we isolated the patients.

13,865. Did you isolate the cases in the Plague Hospital?—No, not on that occasion.

13,866. Where did you isolate them?—In a separate room.

13,867. In their own houses?—In their own houses.

13,868. They both died?—They both died.

13,869. At that time what precautions were you taking with regard to passengers arriving from Bombay?—A system of medical inspection of passengers was begun at the railway station, and all persons arriving from Bombay by rail were examined with the view of isolating all passengers affected with the plague. All goods arriving from Bombay were fumigated with sulphur in the waggons in which they arrived; and a temporary shed was erected in the compound of the Kagrapeth Hospital (for infectious diseases, situated outside the city walls) for isolating plague cases. The inspection of passengers at the railway station, which began on the 5th of October 1896, was first carried out by the Health Officer and four Inspectors of the Municipality, with the assistance of the Medical Officer of the Bombay, Baroda, and Central India Railway at the Ahmedabad station.

13,870. Who is the Health Officer of the Municipality?—He is a Licentiate in Medicine and Surgery of the Bombay University—by name Doshi—a Hindu. All passengers arriving from Bombay were examined at the station, and the names and addresses of those who terminated their journey at Ahmedabad were registered, and the Municipal Inspectors were instructed to keep under their special observation the localities in which these individuals lived, so as to enable them to report any suspicious cases of sickness or deaths which might occur.

13,871. Who are the Municipal Inspectors, are they medical men?—They are trustworthy men; they are ordinary men, who get about Rs. 15 or Rs. 20 a month.

13,872. Are they medical men?—No, they are laymen.

13,873. Have you such a thing as notification of infectious disease in Ahmedabad?—No regular registration.

13,874. How do you know of any infectious disease that occurs in the town?—Simply through the medical practitioners.

13,875. Is the medical practitioner bound to report such cases to you?—No.

13,876. Is he obliged to report to anyone?—No.

13,877. How about the death registration?—Death registration is chiefly effected by counting the corpses. Ahmedabad is a walled city, and every corpse must go out of the city to be buried or to be cremated. There is a register taken of all corpses that pass through the gates by the men at the gates; besides which there are men at every cremation ground. There are, I think, three cremation grounds; and men are kept at the different Muhammadan burial grounds. At these places a register is kept of all corpses which are brought in.

13,878. Who examines these registers?—The Health Officer of the Municipality.

13,879. Is there any diagnosis of these cases?—No. The people simply say whether the person died of fever and so on; it may be pneumonia.

Lieut.-Col. M. L. Bartholomeusz, I.M.S.

Feb. 1899.

13,880. What is the proportion of people buried or cremated here who have been seen by medical men before death; out of 100 corpses, how many do you think have been seen by medical men before being cremated or buried?—I should say 15 or 20 per cent.

13,881. As much as that?—Yes, I should think so; they would be seen by a native hakim.

13,882. What is the number of people in your district?—About 150,000.

13,883. What staff have you?—The Municipality have a staff.

13,884. What staff have you got yourself?—I have a staff of three Assistant Surgeons in the Civil Hospital, and two Hospital Assistants.

13,885. Over how many square miles does your district extend?—I have nothing to do with the work of the district; I have only to do with the town.

13,886. I think you discovered several cases of plague, by railway inspection, did you not?—Yes. By this system of inspection at the railway station inaugurated by the local authorities, 77 persons affected with plague were detected among the arrivals from Bombay and sent to the plague shed—we had a plague shed by that time—for isolation and treatment, from the 5th of October 1896 to the 16th of February 1897, on which date a special inspecting staff was appointed by Government, consisting of a Commissioned medical officer, four assistant medical officers, and four senior pupils.

13,887. Is this Commissioned medical officer in the Indian Medical Service?—Yes.

13,888. Did the number of imported cases of plague increase?—Yes.

13,889. Did you erect Plague Hospitals?—Yes.

13,890. What arrangements did you make with regard to them?—The following hospitals were erected on selected sites about half a mile away from the city with the necessary establishment for each:—

One Plague Hospital for undoubted cases of plague,
One observation hospital for suspected cases,
One segregation camp for apparently healthy individuals coming from plague-stricken houses.

Subsequently the following private hospitals were established by the different communities on selected sites far away from the city:—

One Plague Hospital for the Parsees,
One Plague Hospital for the Nagar Brahmans,
One Plague Hospital for Jains.

The services of Miss Motibai Kapadia, of the Victoria Jubilee Dispensary for women and children, were made available for the examination of native ladies.

13,891. Did you take additional measures later on?—Yes. On the 3rd of November 1897, after the visit of the Plague Commissioner, additional measures for the protection of Ahmedabad and the district were adopted. This consisted in the establishment of an observation camp on an extensive for all arrivals from infected areas, the disinfection of their persons and clothing, and their detention for 10 days.

13,892. How were the persons and clothing disinfected?—The clothing was disinfected by steeping it in a solution of corrosive sublimate.

13,893. Of what strength?—1 in a 1000.

13,894. How was the solution prepared?—We measured the quantity of corrosive sublimate, and took the required quantity of water. Common salt was mixed with the solution, but no acid was used.

13,895. Does the water you used contain much lime?—The water used does not contain much lime.

13,896. How were the persons disinfected?—First of all, they were made to bathe in a very weak solution of carbolic lotion. Subsequently that was done away with, and we simply washed them with soap and water.

13,897. Do you think passengers may have got out at the preceding station, walked to the town, and thus escaped the detention camps?—I do not think they escaped the detention camps here.

13,898. Was there anything to prevent people going out of the station, and walking into the town?—Yes. We had police supervision.

13,899. Along the road?—In the station.

13,900. Which is the nearest station?—There is only one railway station.

13,901. But I suppose there is another station a few miles away; what would prevent a man from getting out there, and walking into the town; could you prevent that in any way?—No, we could not; except the Collector had some sort of supervision over those people. I am not, however, perfectly sure about that. We had not much control over foot passengers from distant villages.

13,902. Do you think people actually got out at another station, and walked into the town?—Some of them might have done so to avoid inspection and detention; but I do not think there were many.

13,903. I suppose you did not detain everybody, respectable persons, for instance?—No; we detained only those people who could not produce security to appear at certain intervals within the 10 days.

13,904. How often did the people who were not detained have to appear?—The majority of them appeared daily for 10 days; but certain other more respectable people, whom he knew, were only made to appear two or three times a week.

13,905. Was the clothing of the people who were not detained disinfected?—They were originally disinfected; but afterwards disinfection was done away with.

13,906. Could you give us the total number of cases imported from October 1896 to April 1898?—This is given in a table which I have prepared, as follows:—

NUMBER of PLAGUE CASES, Imported and Indigenous, from October 1896 to April 1898.

Year and Month.	Imported.		Indigenous.	
	Cases.	Deaths.	Cases.	Deaths.
1896.				
October	10	2	2	2
November	—	1	—	—
December	38	21	—	—
1897.				
January	24	19	—	—
February	9	6	11	4
March	8	6	9	7
April	5	5	4	2
May	5	3	2	3
June	3	3	—	—
July	—	—	—	—
August	2	2	—	—
September	1	—	—	—
October	1	2	—	—
November	1	1	—	—
December	1	1	—	—
1898.				
January	4	2	—	—
February	2	2	—	—
March	—	—	—	—
April	—	—	1	1
Total	114	76	29	19

The total number of imported cases was 114, and deaths 76.

13,907. That is a mortality of 66·6, is it not?—Yes.

13,908. How many of these were bubonic cases?—The majority of them were bubonic cases.

13,909. Did you get any septicæmic or pneumonic cases?—We had some pneumonic cases, not many.

13,910. Did the pneumonic cases develop plague in the camp?—No.

13,911. They came in as pneumonia cases?—Yes.

13,912. How many people got plague in the detention camp?—In the detention camp we had very few cases, one or two.

13,913. Not more?—Not more.

13,914. Do you know the number of people who came into the railway detention camps actually suffering from plague pneumonia?—The pneumonic cases might have escaped notice at the early period.

13,915. Do you think the pneumonic and septicæmic cases were just the cases that might have escaped notice?—Yes; they might have escaped notice at the

early period when attention was chiefly directed to buboes.

13,916. Can you give us an account of the indigenous cases in the town?—The first indigenous case occurred in October 1896. No cases occurred during the subsequent three months.

13,917. Can you trace this case to an imported case. Do you know how that man contracted the disease?—That is the man who, I said, caught the disease from dabbling in railway goods; he was a goods' clerk, I think.

13,918. Up to the 15th of February 1897 you discovered eight cases?—Eight cases were discovered in a square or dehla outside the Sarangpur gate—that is outside the city walls. There were 34 rooms in this dehla occupied chiefly by mill hands. On inquiry it was discovered that the infection was introduced into this square by visitors from Bombay, who had remained 15 days in the dehla and then left.

13,919. Have you any evidence to show that the visitors from Bombay had plague?—No, we made inquiries, and as far as those inquiries went it could not be found that these men had plague. They went away.

13,920. Do the mill hands change frequently from one mill to another—from Bombay here, and from here to Bombay?—No. Most of the mill hands here are inhabitants of Gujarat, Ahmedabad, and its suburbs; they do not come from Bombay.

13,921. What steps did you take to check the disease?—The sick were quickly removed to the Plague Hospital, and the remaining occupants of the square, 67 in number, were sent to the segregation camp. The huts in which the cases of plague occurred were burnt down, and the remaining huts in the square thoroughly fumigated, limewashed, ventilated, and exposed to the sun by throwing open the roofs, and the square closed up.

13,922. How did you disinfect the floors?—We dug up the floors. We used kerosine oil to burn them. We took up the floors for three or four inches. Subsequent to the removal of the contacts to the segregation camp, 3 persons out of the 67 were attacked and removed to the Plague Hospital. These were all bubonic cases. On the 10th of March four cases were discovered in another square.

13,923. Can you tell me how many were bubonic cases?—They were all bubonic cases. On the 10th of March four cases were discovered in another square or dehla in the same suburb outside the Sarangpur gate; two were already dead from plague, and two suffering from it. The dead were cremated, and the sick removed to the Plague Hospital. Disinfection by fire, limewashing, ventilation, and letting in the sunlight was adopted, as in the previous case, and the square was closed and guarded. 28 individuals who occupied the rooms in the square, were removed at once to the segregation camp. Subsequent to their removal, three cases of plague occurred among the 28 segregated, and these three cases removed to the Plague Hospital.

13,924. How many died?—I think the majority of them died; I cannot exactly say the number.

13,925. Did you have any pneumonia cases among them?—No.

13,926. Do you think the second batch of people were infected from the first batch?—I think they were infected from living in the same locality. On the 28th of March one death and three cases were discovered in another square in the same neighbourhood. The methods adopted for stamping out the disease were the same. In this instance 46 contacts were removed to the segregation camps, but none of these subsequently developed the disease.

13,927. Do you think you got hold of all the contacts?—Yes, every one. It was a square with walls all round it. The Health Officer made inquiries, and we had reason to believe that we secured everybody.

13,928. I think you are of opinion that Plague Hospitals should be placed at some distance from the town?—It is my opinion that all Plague Hospitals should, when practicable, be located at a distance of at least half a mile from town limits, that is to say, so long as the disease is within control, and the cases which occur daily are not overwhelming in number.

13,929. Can you give us your reasons for that opinion?—If we admit the fact that rats contract plague, the natural inference must follow that these animals are capable of conveying the disease from place to place through their excretions; for I presume that plague bacilli are found in abundance in the excretions of plague-stricken rats, just as they are found in the urine and fæces of plague-strickened men.

13,930. Have you any special experience of looking for bacilli in fæces?—No.

13,931. Have you any facts to show that plague bacilli are found there?—No.

13,932. Did you find many dead rats in Ahmedabad?—No; I never found a single dead rat anywhere; nor did I hear of dead rats being found anywhere in Ahmedabad.

13,933. I suppose there are a great number of rats here?—Yes, a great number.

13,934. Did you hear of squirrels getting plague?—No, not a single squirrel.

13,935. On the whole, you found that the simple methods of disinfection and partial evacuation answered all your purposes?—Complete evacuation of the infected locality.

13,936. But not the town?—No.

13,937. We have had it in evidence from several sources that the partial evacuation of towns and villages is not successful in stopping plague. Here, on the other hand, it appears to have been perfectly successful. Do you know of any special conditions in Ahmedabad which would render partial evacuation more successful than in other places?—No, except that Ahmedabad is a very dry place. It is an exceedingly dry climate before the monsoon.

13,938. Is the town very much overcrowded?—Extremely overcrowded. On an average there are 100 souls to the square acre.

13,939. There is nothing except the measures you took to which you would attribute the immunity of the town?—That is my opinion.

13,940. (*The President.*) Did you have medical charge of plague cases?—Yes.

13,941. Where?—In the Plague Hospital outside the city.

13,942. They were under your care?—They were not immediately under my care. They were under the care of a subordinate. I visited the cases as often as I possibly could.

13,943. You saw them frequently?—Yes, I saw them frequently.

13,944. Did you ever notice if there was any œdema in plague patients at the anterior portion of the body?—Not in the cases that occurred here.

13,945. Did you ever have an opportunity of seeing plague corpses?—I have seen the corpses after death from plague.

13,946. Did you notice in the corpses whether there is any œdema in the anterior portion of the body?—No, I did not notice it.

13,947. Did you make such examination or inspection, whether in the patient or in the corpse, as would be likely to show any œdema, or might it have easily escaped your notice?—It might have escaped my notice.

13,948. In the case of this town, how many partial evacuations did you make?—Three.

13,949. Were they in the neighbouring areas or distant?—They were in the neighbouring areas.

13,950. Why did you make three partial evacuations?—Because three localities were infected; the rest of the town was not infected.

13,951. Therefore, so far as your evacuations were partial, they were partial only in relation to the entire town, but they were complete in regard to infected areas?—In so far as an infected area was concerned, yes.

13,952. And I suppose the amount of evacuation was dependent upon the size of the area?—Yes.

13,953. Have you to deal with the public health of Ahmedabad?—There is a special Health Officer.

13,954. Your duties do not include that?—As Civil Surgeon I am very often consulted on matters of public health, but I have no immediate supervision over public health, except in epidemics of this sort, when, of course, I am held more or less responsible.

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13,955. But you are not responsible in any sense for the general sanitation of the town?—No.

13,956. Perhaps you would state from your observation what your opinion is of the general sanitation of the town, or of any parts of the town?—My opinion is that it is very unsatisfactory as far as sanitation is concerned.

13,957. In regard chiefly to what points?—With regard to want of drainage, narrowness of streets, overcrowding of the houses, and removal of night soil. The water supply is very good.

13,958. Have you ever been consulted in regard to any of these points officially?—No, except as a member of the Municipality.

13,959. Officially you might be consulted by the Public Health Officer?—Yes.

13,960. Have you ever been consulted officially?—No.

13,961. With regard to any of these points you have referred to, are you aware whether there has been any action taken by the Municipal authorities in recent times apart from the occurrence of plague?—Yes. There has been a scheme for draining the town, and a part of the town has been very satisfactorily drained under the advice of Mr. Baldwin Latham. He came here and inspected the town, and drew up a scheme for draining it. An experimental portion has been carried out, and this has proved so satisfactory that the Municipality intends to extend it throughout the town.

13,962. Is there any other point?—The water supply has been improved latterly, the consequence being that we have had no epidemics of cholera. When I first came to Ahmedabad cholera was a regular visitant every year, but it has disappeared as an epidemic since the introduction of the new water supply.

13,963. I think you referred just now to congested areas. Is it within your observation that the plague occurred most in these congested areas or not?—No, it occurred in the suburb where the crowding is not so great as in the city.

13,964. It did not occur in the city so much as in the other place?—No.

13,965. What is the character of the houses in the congested area?—It was a square with houses all round its sides. They were little houses with no ventilation; little rooms occupied, perhaps, by four or five people when there was room only for a couple.

13,966. Was there one floor, or more than one?—One floor.

13,967. What was the nature of the houses in the other areas?—In the city the houses are double-storeyed; sometimes they have three storeys. But the houses themselves are not so overcrowded as the locality I am referring to—this limited area. The streets are very narrow, and consequently the houses are overcrowded.

13,968. But you referred to the houses being overcrowded in the other area?—Yes.

13,969. Relatively which is more overcrowded—the city, or the other area?—The city is more overcrowded.

13,970. Where did the plague occur?—The plague occurred in the suburb.

13,971. What is the character of the houses in the suburb?—They are single-storeyed houses; in fact they were little rooms—they were not regular houses—they were little rooms built on three sides of a square.

13,972. Each room being a house?—Yes, each room being a house.

13,973. Are they or are they not overcrowded?—They are overcrowded.

13,974. Do you mean less or more than the other districts?—I suppose they are equally crowded.

13,975. What kind of houses are they; what are they built of?—The floors are of mud—cow-dung floors,—with brick and mud walls, and rafter and tile roofs.

13,976. How many openings are there into the outer air?—Only the door, and perhaps two loop-holes—one on each side of the door. The ventilation is chiefly through the tiled roof.

13,977. Accidental openings?—Yes.

13,978. In the city proper what is the character of the houses?—Some of them are several-storeyed houses. The only ventilation they get is from the courtyard in the middle, into which most of the rooms open. A certain amount of light and air is obtained from these courtyards. Of course some light and air is obtained through the main door leading on to the street.

13,979. The door is on the opposite side to the courtyard?—Yes.

13,980. There are openings on the outside, and light and air are obtained from the inside through certain openings?—It is like having a square opening in the middle, and having openings in all directions. The sky can be seen from the courtyard, which is perfectly open. Most of the houses in Ahmedabad are built like that.

13,981. How does light and air get access from the courtyard into the rooms or houses?—Through windows.

13,982. The city houses, as contrasted with the suburban, have windows?—Yes.

13,983. What constitutes a house usually in the city; is it one room or several?—Several rooms.

13,984. Then there is a great contrast between the houses in the chief plague-infected areas and the other areas?—Yes.

13,985. The houses in the plague-infected area have no means of ventilation and consist of one room only; whereas in the area within the town the houses generally consist of more than one room, and have means of ventilation, at any rate, on two sides?—Yes.

13,986. (*Mr. Cumine.*) Kindly tell us where the indigenous cases of April and May occurred. I see that in April there were four, and in May there were two?—Yes, April and May of 1897.

13,987. Where did these particular indigenous cases occur?—One case I know was picked up in one of the streets outside. The six cases did not occur in an epidemic form; they did not occur in any particular locality; they were picked up in the city and in the suburbs outside the city.

13,988. Is then their classification in your table as indigenous wrong?—No, it is not, because we could not trace where they came from.

13,989. Is a dehla a place surrounded by a high wall?—Yes; you cannot get into this square without entering through the main gate.

13,990. Is the suburb in which the cases of February and March occurred, isolated or separated in any way from the main part of the town?—Yes, it is outside the city walls entirely.

13,991. Is it separated by some interval from the city walls?—Yes, there is a main road going all round the city wall, and this suburb is beyond it, about 100 yards away from the main road.

13,992. Is the goods yard inside or outside the city?—Outside, in the railway station.

13,993. How far is it from the town?—Of course it is more or less part of the city, separated by the city wall, that is all. The city wall is the only thing which separates it. It is on the railway premises in the suburb near to the railway station.

13,994. How far is it from the city wall?—Not a quarter of a mile from the city gate.

13,995. Is there a clear space between the goods yard and the city gate?—There is a clear space and there are also houses. There is a clear space, and then there is a road leading on to the station, and then you come to shops and other habitations.

13,996. Assuming that two of the three cases of October caught the plague in the goods yard, and went to their houses in the city, and were taken ill there, would you class those as imported cases or indigenous cases?—I should say they were indigenous. They never went out of Ahmedabad, and they caught the disease in the place.

13,997. Though they may not have been imported as regards Ahmedabad as a whole, might they not be regarded as imported so far as the particular quarter of the town in which they were discovered, viz., the city proper, is concerned?—Yes. They went from an uninfected locality, and they came in contact with either goods or men coming from an infected locality, and

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they went back to their own locality, which was uninfected.

13,998. If they were in contact in the goods yard with goods that had come from Bombay, or elsewhere, is it not possible that they were also in contact with persons that had come from Bombay or elsewhere?—It is quite possible.

13,999. I will put it in a stronger way. Is it not probable that they would come in contact with persons from other places, such as the guards, porters, firemen, and drivers, of the goods trains?—Yes.

14,000. That is probable?—Yes.

14,001. (*Dr. Ruffer.*) Could you tell us whether there is a Provincial Sanitary Board in the Province of Bombay?—There is a Sanitary Board.

14,002. Has that Sanitary Board ever met here in your time?—One member comes here almost every year.

14,003. Who is the member?—Mr. Pottinger, the Sanitary Engineer.

14,004. Have you ever been consulted by the Sanitary Board?—No.

14,005. Has the Sanitary Board ever occupied itself with the town at all, ever visited the town, or taken any steps to improve the town?—Nothing, except recommend the Municipality to do so.

14,006. It has done that?—I believe so, but I am not quite sure.

14,007. It could not have done so without having consulted you, could it?—They might have made certain recommendations to the Municipality directly, without my knowing anything about it.

14,008. (*The President.*) You said the man who visited here was the Sanitary Engineer?—Yes.

14,009. What was his object in visiting?—To report sanitary matters to Government.

14,010. Not in connection with the water or sewage scheme?—No, not in connection with any scheme for the city.

14,011. Are you aware of any report that he has sent in?—No.

14,012. (*Dr. Ruffer.*) The sewage and water schemes were chiefly due to the initiative of one man, and not to the Municipality at all. Is it not so?—Yes; it was due to the late President of the Municipality personally; it was his influence and his entire idea.

(Witness withdrew.)

K. B. Bomanji Edalji Modi.

KHAN BAHADUR BOMANJI EDALJI MODI, called and examined.

14,013. (*The President.*) You are District Deputy Collector of the Kaira District?—Yes.

14,014. (*Mr. Cumine.*) What district has your experience of plague been in?—In the Kaira district. Last year when there was plague in the Territories of the Gaikwar on the east and south of this district, arrangements were made for the segregation of persons coming from infected localities. No pilgrim, whether from infected or uninfected locality, has been allowed to visit Dakor, where there is a temple of great celebrity, since the outbreak in Bombay in 1897. Last year arrangements were made to stop all passage of travellers across the Mahi river which flowed between this district and the infected Gaikwari Territories; only at one place travellers were allowed to cross on condition that they remained under detention for ten days. These arrangements continued up to June, when the Mahi river became unfordable. As plague broke out again in Savli, a Gaikwari town beyond the Mahi, a cordon was again placed along the river about the 15th of September 1898. Every watch was kept at large villages to stop Savli people from getting in. On the 3rd of August 1898 a number of Golas or rice-pounders from Savli came to Umreth Town in our district, but were stopped and sent back. In Karamsad, a large village of our district, some Pattidars or wealthy landowners had come, but were found out. Everywhere a strict watch had been kept, but on the 23rd August 1898 two rice-pounders of Umreth Town went to Savli to perform the funeral ceremonies of a relative who had died of plague, and returned stealthily, crossing the Mahi river in a boat at an unguarded point.

14,015. Will you tell us whom you had to guard the river?—Last year there was a special establishment appointed by Mr. Lely, the Commissioner, and he had employed, at every ford and at every place where the river was likely to be crossed, watchmen to stop all the people crossing the river, and at every ford there were supervisors and inspectors who had to patrol the river to see whether the watchmen at each of the posts were doing their duty properly. There were mounted police employed also who were lent by the Nawab of Cambay and the Nawab of Balasinor. This establishment was kept until June. In June, when the river became unfordable on account of the floods, and when the plague was dying out in the Territories, this establishment was removed.

14,016. What was the length of the frontier to be guarded?—Approximately 100 miles.

14,017. What was there to prevent the people crossing in boats?—All the boats had been ordered to be removed, and the Gaikwari authorities had also been working with us.

14,018. That deals with the people arriving by road. How did you deal with the people arriving by railway?—At Wasad, a railway station on the Mahi river, the people who alighted were detained, disinfected, and kept under observation for ten days, and then allowed to go. There was another large camp establishment at Anand, for all through passengers coming from the south side, and also for all passengers who were going into our own district.

14,019. Which was the first place in which plague broke out in the Kaira district?—Umreth.

14,020. On what date was plague officially declared there?—26th September 1898.

14,021. What is the population of Umreth?—According to the census of 1891 it was about 15,600.

14,022. Did subsequent inquiries show that the disease must have been in Umreth for some time?—I found that out. Subsequent inquiries have shown that the disease must have commenced before the 9th September, when a boy of the Gola caste died. That death was not reported to the Municipal Inspector according to our Municipal rules. There is a Municipal rule that every death occurring in the town must be reported within 24 hours. A Municipal Inspector found out this case on the 13th, and the Municipality ordered the prosecution of the parents for not giving information about the death. On the 15th September another case occurred, and the authorities made inquiries with regard to that case also, but they thought it was not plague.

14,023. Did it occur in the same house?—No, just close to the house in which the boy died on the 9th. The Second Class Magistrate and the Hospital Assistant made inquiries about this second death but did not think it was plague, though they reported the circumstances to the Mamlatdar.

14,024. Did they see the body?—The Hospital Assistant did see it. Another death of a woman, aged 15, took place in the adjoining house on the 17th September, and a fourth death of a woman, aged 35, took place in the same street on the 19th. The cases which were discovered on the 26th September were confined to the same locality.

14,025. Were the bodies of the women aged 15 and 35 seen by any medical man?—Yes, all these bodies were examined by the Hospital Assistant. These were real plague cases, because they occurred in the same locality. Now, it is to be observed that the two Golas who had gone to Savli on the 23rd August are still surviving, and the disease must have been brought in either by them, or by some other persons whom we have not been able to discover, notwithstanding very careful inquiries made by us. No one of those who have died are found to have gone out. If the disease was

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imported by the two Golas, who are proved to have gone to Savli and returned from there, then it must have been brought in their clothes or other articles that they might have had with them. The house in which the boy died on the 9th is close to that of one of the two Golas.

14,026. Then you do not know for certain which the first case in Umreth was, or how the infection was brought in?—Not for certain.

4,027. What was the part of the town in which the first discovered cases were found?—In the Gola quarter.

14,028. What did you do on the discovery of those cases?—Dr. Mody went up at once on the 26th September and evacuated the whole of the street and discovered six cases.

14,029. Where did you take the evacuated people?—To a place outside the town at about a quarter of a mile distance.

14,030. Where did you put the plague-stricken people whom you found?—In another locality at a little distance off. There was a field intervening.

14,031. Did you allow their families to go with them into the plague camp?—Only one or two relatives went there.

14,032. What did you do with the other people of the infected houses?—They all lived in what may be called the segregation camp.

14,033. Were the rest of the people who were neither in the plague camp nor in the segregation camp allowed to go to their work every day?—The Golas who had to leave their street were not allowed to go. They were all in the segregation camp whether there were any cases in their families or not, and there was a police guard kept there.

14,034. Did you make out a census of those in the segregation camp?—Yes.

14,035. Did you have a roll-call?—Yes.

14,036. Did you have hut to hut inspection?—Yes, morning and evening. There was a Hospital Assistant doing that work there.

14,037. Before they returned to the town did you disinfect the quarters of those Golas who had been evacuated?—Yes; we dug up the floors according to the standing orders and burned the earth in circular kilns. Then we disinfected the house with solution of perchloride of mercury of the prescribed strength, 1 in 1,000. We disinfected the whole of that street, and afterwards we took up other streets.

14,038. Did you use perchloride of mercury not only in the houses where cases had been found but in all the houses?—The whole of the street.

14,039. Amongst the people who remained in the town did you have any house to house visitation to find out whether plague was spreading?—We had begun taking the census of the whole town, and we had appointed 12 enumerators, and their duty was to take down the muster every morning and to see whether the people were in good health or not. As soon as it was discovered that any person was ill, that was reported to the Hospital Assistant and the Municipal Secretary, and they would go to that place and ascertain whether the man was suffering from ordinary illness or from plague.

14,040. Did you find that plague spread amongst the people remaining in the town, and if so did you resort to further evacuations?—The adjoining streets of Dalalpol, Kachhiawad, Vada Bajar and Malekwad, were vacated on the 7th October; the Mota Mandir Street, Retia Pol, and Sevaklal's Pol, which are to the east of the streets evacuated on the 7th October, were evacuated on the 16th. It may be observed that the people, as a rule, went out without any demur with the exception of a few who were instigated by a pleader, and who made an application by telegram to the Plague Commissioner. Pipaliawad and Ralwaliawad Streets on the north and east of the last evacuated localities, were vacated on the 17th October. The Satak Pol, the Talati Pol, and the Rughnathji Pol, were ordered to be evacuated on the 28th October; these were to the south of the first infected locality; the Thakur Vaga, Girasiawad and Bhatwada Pol were vacated on the 2nd November; more than half the town was thus evacuated. On the 20th November the Dhers' and Chamars' quarters, which were on the north side of the town, were evacuated, as cases occurred there.

14,041. Did you find that each partial evacuation failed to stop the spread of the disease to other portions of the town?—Yes, and eventually we had to evacuate the whole of the town. It was completely empty on the 24th November.

14,042. With regard to the Golas whom you took out first, you told us there was a police guard over them to prevent them going out by day to their work. In the same way did you prevent the people whom you subsequently evacuated from going by day to their work?—No, they were only told to live in the fields, in the open, because they were not infected already.

14,043. Had you any census and roll-call for them?—Yes; we had 17 enumerators for the people (about 9,000) who were in the fields.

14,044. Was the roll-call taken every morning?—Yes, and they had to give their reports about the health of each and all of the people.

14,045. When, amongst these people in the fields, persons were discovered suffering from plague, did you take them from amongst the healthy people?—Yes, they were taken to the Plague Hospital.

14,046. You did not put them into huts some 50 or 100 yards from the cluster of huts in which they were living?—No. I only allowed that in three or four exceptional cases where the people were respectable and where they themselves offered to build separate huts for their patients.

14,047. I will ask you to give us statements showing (*a*) the weekly attacks and deaths; (*b*) total attacks and deaths by race (giving castes), secondly by sex, thirdly by age; (*c*) the number of admissions and deaths in the Plague Hospitals; (*d*) attacks and deaths in the segregation camp, showing in each case on what day after admission the plague developed; (*e*) similar information with regard to voluntary camps, that is camps inhabited by people evacuated subsequently to the 26th September; (*f*) the number of attendants in the Plague Hospitals who were attacked; and (*g*) the number of relatives who were attacked while attending on patients?—I will do so. [The following statements and information were subsequently supplied by the witness]

(*a*).

UMRETH TOWN.

Serial Number of the Week.	Dates of the Week.		Number of	
			Attacks.	Deaths.
1	23·9.98	29.9.98	15	8
2	30.9.98	6.10.98	7	8
3	7.10.98	13.10.98	5	5
4	14.10.98	20.10.98	5	6
5	21.10.98	27.10.98	6	5
6	28.10.98	3.11.98	15	12
7	4.11.98	10.11.98	10	8
8	11.11.98	17.11.98	12	7
9	18.11.98	24.11.98	6	7
10	25.11.98	1.12.98	5	4
11	2.12.98	8.12.98	9	8
12	9.12.98	15.12.98	1	1
13	16.12.98	22.12.98	5	4
14	23.12.98	29.12.98	3	1
15	30.12.98	5.1.99	2	2
16	6.1.99	12.1.99	2	3
17	13.1.99	19.1.99	1	1
18	20.1.99	26.1.99	1	1
19	27·1.99	31.1.99	—	—
			110	91

(*b.*)

UMRETH TOWN.

Name of Caste.	Under 1 Year.				Under 10 Years.				Under 20 Years.				Under 30 Years.				Under 40 Years.				Under 50 Years.				Under 60 Years.				Total.	
	Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Male.		Female.		Cases.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Golas	1	1	–	–	5	4	5	3	1	1	6	5	3	2	–	–	4	3	5	4	3	1	–	–	1	1	–	–	34	25
Bhavsat	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Banniah	–	–	–	–	1	1	1	1	1	1	–	–	1	1	1	1	2	2	1	1	2	2	–	–	1	–	1	1	12	11
Borah	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	2	2
Kumbhar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	–	–	–	–	–	–	2	–
Kansara	–	–	–	–	–	–	1	1	–	–	–	–	1	–	1	1	–	–	–	–	–	–	–	–	2	1	–	–	5	3
Brahman	–	–	–	–	–	–	–	–	1	1	1	1	5	4	1	1	1	1	1	1	4	4	–	–	1	1	2	2	17	16
Tapodan	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	1	1
Dhobi	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
Barber	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	*	–	–	–	–	1	–
Tailor	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Carpenter	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	1	1
Pattidar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Rawalia	–	–	–	–	1	1	–	–	1	1	–	–	–	–	–	–	1	1	–	–	1	–	–	–	–	–	–	–	4	3
Kachhia	–	–	–	–	–	–	–	–	–	–	2	2	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	3	3
Kandoi	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Bhangi	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Chamadia	–	–	–	–	–	–	–	–	2	2	1	1	1	1	–	–	–	–	–	–	–	–	1	1	–	–	–	–	5	5
Dher	–	–	–	–	–	–	–	–	1	1	1	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	2
Dharala	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	2	2
Musalman	–	–	–	–	–	–	–	–	1	1	1	1	1	1	–	–	–	–	1	1	2	2	1	1	–	–	–	–	7	7
Rajput	–	–	–	–	–	–	–	–	1	1	–	–	1	1	–	–	–	–	1	1	2	1	–	–	–	–	–	–	5	4
Dahgar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	–	–	–	–	–	–	–	1	1
Total	1	1	–	–	8	7	10	6	10	10	12	11	15	12	7	6	9	8	10	9	16	11	4	4	5	3	3	3	110	91

(*c*).

The number of admissions and deaths in the Plague Hospital at Umreth were 64 and 48 respectively. The figures regarding the villages cannot be obtained.

(*d*).

This information cannot be obtained.

(*e*).

This information cannot be obtained.

(*f*).

No attendant has died either in the Umreth Plague Hospital or in any village hospital.

(*g*).

Only one or two attendants were seized, but it is not certain that they had not got the disease from the village.]

14,048. What was the date of the last attack in Umreth?—Cases are still going on now and then.

14,049. Are the people still out?—Yes, and the work of disinfecting the houses of the whole of the town has now begun in earnest again.

14,050. Do you disinfect every house, whether it was infected or not, with perchloride of mercury?—Yes.

14,051. Do you put any acid in the perchloride of mercury?—Hydrochloric acid.

14,052. When plague had been discovered in Umreth what precautions did you take to prevent it spreading to the villages?—The Mamlatdars were directed to obtain weekly returns of death from every village, and see if there were any grounds for suspecting that plague had entered. Registers containing the names of all the persons living in the villages were prepared, and the village officials were directed to examine the inhabitants every day and to ascertain if any person had come in from infected places. All persons coming from infected places were kept under strict surveillance, and the village officials had to submit a daily report regarding the health of each individual who had come from an infected place. In the villages watch was also kept at the entrances into the village for stopping the strangers. The chief reason why the village officials could not succeed in some villages, in preventing the introduction of plague, was that they could not know that a person residing in the village had gone to an infected place; when questioned people would say they had been returning from the fields. Several Umreth people went at the time of the outbreak to live in surrounding villages and in distant towns, such as Nadiad and Kapadvanj; and those who had gone to these towns could not visit Umreth without the fact becoming known, while those living in the surrounding villages could easily go to Umreth in the morning and return before noon, and allege that they had only gone to the fields to see their lands, or to see their constituents. Similarly the original inhabitants of the villages could go and return, and allege that they had not gone to Umreth.

14,053. In spite of these precautions did a certain number of villages get infected from Umreth?—Yes. The first village which became infected was Sureli, about five miles to the east of Umreth. The disease was reported there on the 12th November 1898, but on making inquiries I found that the first plague death occurred there on the 6th November and the second on the 8th November, both being Banniahs of Umreth, who had come to live in the village since the middle of October. Although they lived at this village they used occasionally to go to their Umreth houses, and must have got the plague from their houses which were in an infected locality. After their deaths more plague cases occurred in the vicinity of their houses. In one house three persons were carried off. The next village attacked was Dhanadra, about three miles to the north-east of Umreth. Here, too, it appears a Banniah of Umreth had brought the plague. In the village of Bhatpura the disease appears to have been brought by a Koli of the village having gone to a house in Umreth to fetch some things for a Banniah.

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14,054. Have you had other villages infected but not from Umreth?—In Kuni, a village in Thasra Taluka, it appears the disease was brought by a Musalman who came from Godhra. The death of this man was not reported by the village authorities; other cases took place in the vicinity of the house in which the man died, and then the Mamlatdar received information. Steps are being taken for the punishment of the village officials. In Od there were some suspicious deaths occurring; the village officials were making reports about them, and the doctor could not in the beginning say they were from plague. The origin of the disease cannot be traced, but it appears some person from the other side of the Mahi must have brought it, because no one from Umreth had gone to this village. In the adjoining village, Sili, also it appears it must have been brought by some Kolis who had gone to the other side of the river Mahi; no one, however, would admit having gone there.

14,055. In these cases it would appear that your cordon failed to keep out the plague?—Yes.

14,056. When plague was discovered in one of the villages, what did you do?—The villages were evacuated immediately on the appearance of the disease; in large villages like Od containing 8,000 inhabitants, or Bhalaj containing 4,000, the people took about four or five days to move out. In Kalsar, a village of Thasra Taluka where the disease broke out on the 17th December, only the Dher and Chamar quarters were evacuated, as they were on one side of the town; no disease appeared in the unevacuated part until the 7th January. The whole village has been evacuated since then.

14,057. When you evacuated a village did you put the plague-stricken people apart?—Yes. There were always hospital sheds erected at once in each of the villages, and separate segregation huts also.

14,058. Did you allow the people to go to their daily work?—Yes, the healthy people who were living in the field camps, in their own camps, were allowed to go to their work.

14,059. Had you any roll call?—Yes, in every one of of the villages.

4,060. Did you make them sleep in the camp at night?—Yes; they were not allowed to go to their houses at all. They were allowed to go to their work during the day, but not to their houses; they went to work in the fields. We had men at the entrance of the village to see that nobody came and lived in the village. We kept watchmen there, sometimes policemen, and the village watchmen and the police patrol had to see that nobody went and lived in the houses.

14,061. Did you not only keep them out of the village site at night, but also make sure that they slept in the camp?—No, we had no such establishment.

14,062. Can you give us any instances of villages where the plague was discovered early, and was stopped at once?—Yes. In Lingda village a man who had gone to live there from Umreth got attacked on the 25th October, and was immediately removed outside; the whole street was evacuated and disinfected, and the village was quite free until it became reinfected on the 28th December last. Two cases occurred in two different localities on that day; there also the people were taken out at once, and the surrounding houses disinfected. The whole village of about 1,677 souls has been evacuated, and there are no more cases. In Sundalpura village on the 17th November one imported case was detected in time. The people of the surrounding houses were segregated, and the houses disinfected. The disease did not spread at all. In Hamidpura an imported case occurred on the 18th November and owing to the usual measures having been taken, the village was free until the 14th December 1898, when imported cases occurred, and not having been found out in time spread the disease. In Thamna village an imported case occurred on the 25th November. The whole family was segregated, and the people of the street were turned out, and the houses disinfected. The disease did not spread in the village, though one by one all the members of the family, consisting of the man, his wife, and two young daughters, died. This village became again infected on the 29th October 1898 owing to certain tailors having gone to an infected village.

14,063. I will ask you to put in a statement regarding each of your infected villages, showing how many indigenous cases in all had occurred up to the date of evacuation, and how many on each of the days subsequent to evacuation; where the person attacked was employed on disinfecting operations, I should be glad if you would make a note of that fact?—Yes, I will do so.*

14,064. After the evacuation of a village did you have a roll-call of the evacuated people daily?—Yes, in the morning. Schoolmasters and their assistants were employed on this duty, and where there were no schoolmasters we employed the village officials and paid enumerators.

14,065. Did you find that many people ran away after evacuation?—Not in the villages.

14,066. Did you find that amongst the huts in the voluntary camps disease spread from person to person or from hut to hut?—Not at all.

14,067. Have you noticed any cases where people who were sent to whitewash a disinfected house have caught the plague?—Yes, in Umreth town after we had disinfected the whole of the Gola quarters and when the number of cases had stopped altogether we sent the Golas from the segregation camp to limewash their houses before they were allowed to go and live there. Two Golas caught the disease, and after that others would not go to the houses, and I also stopped them from going.

14,068. Could you be certain that it was from a disinfected house that they caught it, and not in an undisinfected house?—I had made inquiries from the Golas themselves and they said they had not gone to any other house, and all the houses in the neighbourhood had been disinfected.

14,069. Have you ever noticed whether, when a quarter of a town has been evacuated, the plague spreads through the empty houses which were not infected when the people went out?—Yes, generally that is my experience. I made a note of every one of the cases which occurred, and found that the cases were on account of the people visiting their houses and in some cases of their having moved out when it was too late, they having imbibed the poison beforehand.

14,070. Have you any cases of a man returning and catching plague in an evacuated house which was not infected at the time of evacuation?—Most of the cases which occurred in the fields were of persons who had returned to their houses which were not infected at the time of evacuation.

14,071. Do you say this from notes which you took at the time?—Yes, from day to day. I made particular inquiries with regard to each of the cases occurring in Umreth and as far as possible in the villages also. Whenever I visited the village I made inquiries as to how they got it.

14,072. How do you think the disease is carried from one village to another?—In most of the cases I have been able to ascertain that it was brought in by persons coming from infected places. In some cases I could not find it out; rats were said to have died first. My theory would be that the poison must have been brought in some goods or articles, and the rats must have been first poisoned, and then, of course, disease would break out among men.

14,073. Can you name any village in which rats were infected before men were?—Yes, Vinzol. In Vinzol village we found two or three cases on the 11th January, and we ascertained that rats had been dying there for more than a fortnight before. The Police Patel himself turned out from his own house because a dead rat was found opposite his house. He reported that fact to us also. Afterwards rats were found in another street, and about four days after that men were attacked. Captain Somerset had come to assist me, and he and I went there and made all those inquiries.

14,074. Are you satisfied that no human being had been attacked in the village of Vinzol before the rats?—Yes. We had been taking a daily census of all the healthy villages also.

14,075. Was there any infected village near this village of Vinzol?—It is near to Umreth town; about 1½ miles exactly to the north.

14,076. Have you noticed many dead rats in this epidemic in the Kaira district?—Many in Umreth Town and other villages. In Umreth Town, I think, about 200 rats must have been burnt by our men. Squirrels also had been affected.

* See Appendix No. L. in this Volume.

14,077. How many?—I have not made any notes, but I have seen some squirrels dying, and I have also heard of it from my subordinates.

14,078. Was there any particular house in which rats appeared to you to be infected before men?—I have not made notes, but I have an impression that that was so in several cases. For instance, near Dakor there is a temple in which certain men were living, and dead rats were found there. Afterwards there was one attack. Then again, in Bhatpura dead rats were first discovered, and then we made a search. I went also to that village and found there were cases occurring there.

14,079. Have you noticed suspicious deaths amongst any animals other than rats?—I had seen cats with my own eyes lying in the streets, but I cannot say whether they had died of plague or not. There were two monkeys in Dhunadra village.

14,080. Did you have the bodies of any of the squirrels, cats, or monkeys examined?—No.

14,081. Have you any observations to give us regarding fleas?—Yes; in every infected village swarms of fleas would come out; they would come out even into the open streets from the houses, and in the houses they would be swarming in great numbers after plague. That also I personally noticed. The Hospital Assistant made a report to me with regard to Od village that he suspected these fleas carried the plague poison. That, of course, was his mere guess.

14,082. Did you notice whether the appearance of fleas in a house preceded the attack of human beings in the house or followed it?—The appearance of fleas generally followed an attack in a human being.

14,083. Did you ever have any corpse inspection in the Kaira district?—No. Whenever a man died from plague he died in the hospital, and it was not necessary to examine the corpse, but if a man died without our knowing about it, when we did come to know about his death the Hospital Assistant would go and examine the body.

14,084. What was done in the case of females?—The Hospital Assistant would examine the body in the same way.

14,085. How long has that been going on?—Since the outbreak of plague.

14,086. Is it going on still?—Yes; but now there are very few cases in which we only hear of the deaths after they occur. Generally we receive information about the cases in time. People do not conceal cases nowadays, either in the town or in the villages.

14,087. When you say the Hospital Assistant examined the corpses, do you mean he really examined them or only looked at them?—He feels the body to see whether there are any buboes and he looks at the body.

14,088. Have you anything to say about inoculation?—About 863 persons have been inoculated by Miss E. H. Hodge, M.D., New York, of the Methodist Episcopal Church Mission in Umreth and the surrounding villages. A clerk and a peon is given to assist her in the work. As the inoculated persons all live in the open camps, there is no ground left for testing the efficacy of the prophylactic.

14,089. Returning to the subject of disinfection. Who supervised the preparation of disinfectants in Umreth?—In the beginning I did, and afterwards the Awalkarkun of the Mamlatdar often superintended that work.

14,090. What did you prepare it in?—Wooden casks, in a strength of 1 to 1,000, according to Dr. Maynard's prescription.

14,091. Under whose supervision was the perchloride of mercury applied in the houses?—The Awalkarkun, and there was another man also who was the first assistant of the school, who knew the work, and occasionally the Hospital Assistant went there.

14,092. (*Dr. Ruffer.*) Can you tell me whether any of the people inoculated by Miss Hodge have died?—As far as I know none have died, but I heard only four days ago that one of the inoculated persons, a native Christian girl, got the disease about four days after inoculation.

14,093. Can you give us the particulars of that case?—I heard this from Miss Hodge herself.

14,094. Do you know on which side that girl had the bubo?—I do not know.

14,095. You say that in some villages rats were infected with plague before men?—Yes.

14,096. On what facts do you base that statement?—The village officials reported about rats dying; they had seen rats with their own eyes.

14,097. At that time they had seen no case of plague?—No, there was no case of plague then.

14,098. How do you know that?—Because we would examine all the persons who are entered in our village census. There is a regular census kept of all the inhabitants, male, female, and children, and we could ascertain from that by inspecting all the people, whether any of them were ill or not, or whether any of them had died.

14,099. But you are not certain that someone had not come from another village and died there?—Yes, he might have come to that village and gone back. It is a possibility.

14,100. The plague must have been brought to that village by someone?—Yes, either in his clothing or in articles which were carried with him, or he might have deposited the poison in his excreta and gone back.

(Witness withdrew.)

Assistant-Surgeon M. M. Mody, called and examined.

14,101. (*The President.*) You are an Assistant Surgeon?—Yes.

14,102. And you have been in charge of the disinfection camp at Anand?—Yes.

14,103. What is your medical qualification?—I am a Licentiate of the Bombay University.

14,104. How long have you been on duty in this camp?—Since December 1897.

14,105. Does that comprehend the whole of your plague experience?—Yes, except that I was a few days at Palanpur.

14,106. (*Dr. Ruffer.*) You were in charge of the medical inspection of the trains?—Yes.

14,107. How was this inspection carried out?—The whole train was emptied, and the passengers taken into a compound near the disinfection platform. Each passenger was then strictly examined, and the least doubtful case submitted to the clinical thermometer test. Persons found suffering from fever were sent into the observation hospital from which they were discharged as soon as they were free from all suspicion of plague. The examining Medical Officer filled in a form for the information of the Medical Officer in charge of the hospital. Those suffering from plague were taken direct on a stretcher to the Plague Hospital. The detenus were examined twice a day, a register of the inmates of each hut being supplied to the examiner.

14,108. Who examined them?—The railway inspection was by Hospital Assistants, but the detenus were examined by vaccinators and medical pupils. To avoid waste of time a horn was sounded 20 minutes before the examination time to enable the detenus to be ready and arrange themselves in a line in front of their huts. The absentees were noted and the examiner came for them again after he had finished his work. Doubtful cases were sent with a memo. to the observation hospital and the plague-affected with a red card to the Plague Hospital.

14,109. Did you find that some of the men did not turn up again?—No. No time was lost in segregating the contacts and dismantling the hut where a plague patient was discovered. The segregated were also examined twice a day. Each person was examined on his leaving the camp, and if found healthy the Medical Officer countersigned the pass in token thereof.

14,110. How many patients had you in the Plague Hospital?—We had accommodation for 16 patients and 16 attendants.

14,111. How was your hospital built?—It was built of millet seed stalks lined with bamboo matting, which was whitewashed.

Assist.-Surg. M. M. Mody.

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14,112. What precautions did you take after a patient had died or had left the hospital?—The ground was dug up and the bamboo matting was again white-washed, and the floor treated with perchloride of mercury. The clothes were all burnt.

14,113. What solution of perchloride of mercury did you use, alkaline or acid?—At first we used to make it alkaline with salt, but afterwards we used hydrochloric acid, 1 to 2.

14,114. How were the patients treated in the hospital? Were they visited frequently?—Yes, we had to do so because we could not get ward-boys. The patients were visited twice a day, and oftener when necessary. Their symptoms, progress, and treatment were recorded in the usual hospital case form. The temperature was registered twice a day in a separate book, in addition to that of a chart, and the diet was also marked in the same book.

14,115. How many plague patients were there?—78.

14,116. How many of these cases were pneumonic, how many bubonic, and how many septicaemic? I take it these cases were all detected in the railway station?—Yes, or within the camp within ten days. There were 54 bubonic, 14 pneumonic, four bubonic and pneumonic, five atypical, and one septicaemic.

14,117. What do you mean by atypical cases?—Those who had neither bubo nor pneumonia.

14,118. How do you know they were cases of plague? There were other symptoms, a suspicious tongue, drowsiness, and the rapid course of the disease.

14,119. How many of these atypical cases died?—Three died and two recovered.

14,120. How many of the pneumonic cases died?—All the 14.

14,121. Did any of the bubonic cases get pneumonia during the course of the disease?—Yes.

14,122. Were these pneumonic cases related to one another, or living in the same tent, or did they come from different batches?—Different batches.

14,123. Did you ever see a bubonic infected from a pneumonic case?—No.

14,124. Did you ever see a case of pneumonic plague infected from another case of pneumonic plague?—No.

14,125. What precautions did you take before the discharge of the patients?—On discharge, the kit of every patient was re-disinfected. In cases where the bubo suppurated and had to be opened, the patients were not discharged till the bubo had thoroughly healed. Whenever a patient died all clothing of little value was burnt, the remaining being handed over to friends or relatives after thorough disinfection.

14,126. What do you mean by thorough disinfection?—With perchloride of mercury, 1 in 1000 acid.

14,127. Did that not spoil the clothes?—No, we did not disinfect the clothes with perchloride of mercury but by steam.

14,128. What temperature of steam?—250.

14,129. Under pressure?—Yes, 25 lbs. to the square inch.

14,130. Who made your steam disinfector?—It was made by the railway engineer here.

14,131. How did you dispose of the bodies?—All Hindus were burned and all Muhammadans buried.

14,132. Did you put carbolic acid in the graves?—Yes.

14,133. How many cases of plague did you detect in the observation camps?—78 in all.

14,134. That is counting those detected on the railway?—The railway and the observation camp was one.

14,135. Did you ever take a plague patient out of a train, or did all the patients get plague in the observation camp?—There was no inspection at the railway station. They were brought through a tunnel into the camp.

14,136. What was the shortest time in which anybody showed symptoms?—Immediately.

14,137. How many did you discover immediately?—About eight cases.

14,138. What was the longest period during which people remained in the camps before they were attacked with plague?—One was detected on the eleventh day.

14,139. I thought they only stopped ten days?—The day of arrival was not counted.

14,140. Did he infect himself in the camp?—If our precautions were all right he could not, because no case occurred in the same hut. All huts were marked, and no two cases occurred in one hut.

14,141. Did they not visit one another?—They did visit one another.

14,142. What do you do with the hut when a patient was detected in it?—It was immediately dismantled and the floor saturated with perchloride solution; then we used to destroy the bajri stock.

14,143. Did you do the same in the general camp?—Yes, and the hut was not allowed to be used for eight days at first, and afterwards for four days. The materials were all exposed to the sun.

14,144. What were the sanitary arrangements in the camp?—We had a plot of ground about 150 feet square which was used for latrine purposes. The night-soil was collected as soon as it was evacuated, and carried in head-loads to the depôt where it was dried and burnt.

14,145. Did you find that answer?—It answered very well.

14,146. The water supply was derived from the town?—From a well. It was the railway well.

14,147. By means of pipes?—Yes.

14,148. How did you treat the wells?—With permanganate of potassium.

14,149. How much did you add?—One ounce to a well.

14,150. Did you use one ounce, whatever the depth of the well?—We used half an ounce for the small wells and one ounce for the big wells.

14,151. (*The President.*) Solid or in solution?—Solid powder; we used to mix it in a bucket of water and throw it inside at night.

14,152. (*Dr. Ruffer.*) What was your medical staff?—Myself, four Hospital Assistants (full time), one Hospital Assistant (half time), one civil medical pupil, two vaccinators, four medical pupils, and five ward boys.

14,153. Each Medical Officer had a section of the camp under him?—Yes.

14,154. How did you manage at night?—The Medical Officer used to stay in the camp itself; he had quarters in the camp.

14,155. Was there a Medical Officer awake during the night?—If necessary he was sent for.

14,156. Who remained awake in the camp?—The ward boys.

14,157. Who looked after the patients?—The ward boys and their relatives.

14,158. (*The President.*) You said that some bubonic cases acquired pneumonia before they recovered?—Yes.

14,159. Within what time?—In some cases it was the first, and in some the second or third day, after development of bubonic symptoms.

14,160. Did all these cases terminate fatally?—Yes.

14,161. Had you any opportunities of making bacteriological examinations?—No, I had no opportunity.

14,162. Were any made in connection with your cases?—No.

14,163. Why not?—Because we had no time and no apparatus.

(Witness withdrew.)

Mr. F. X. de Souza, I.C.S.

Mr. F. X. DE SOUZA, I.C.S., called and examined.

14,164. (*The President.*) You have been Assistant Collector of Kaira?—Yes.

14,165. You have been in charge of the observation and detention camps at Anand?—Yes.

14,166. In connexion with your work you have prepared a report, which you propose to hand in?—I have submitted a full report to the Government. I have not the statements of that report with me; they are in the office at Kaira, but I have summarised that report in the précis of my evidence.

14,167. When was this camp formed?—The camp was opened on the 24th November 1897, and closed as a detention camp on the 17th May 1898. Since then it has been kept up as a disinfection camp for persons arriving from infected localities.

14,168. What was the primary purpose of this camp?—At first it was made to be a disinfection camp. Subsequently when plague got worse in Bombay, Surat and Baroda, the Plague Commissioner ordered that it should be made a detention camp for all through passengers, but the rules as to detention were greatly relaxed, in May and since then, notwithstanding the recrudescence of plague in Bombay and Baroda, the camp has only been kept up partly as a station for medical inspection and partly as a disinfection camp for arrivals from infected localities.

14,169. Do I understand that it is in connexion with the railway station?—Yes, in connexion with all through passengers passing through Anand station.

14,170. In which direction?—Anand is a large junction station. It is the junction for the whole of Northern India to Rajputana, and all stations north of Anand. It is the junction for the Petlad railway going west, and for the Rajputana Malwa branch railway, going to Rutlam.

14,171. Where do these passengers come from?—South of Anand, that is to say, Bombay, Surat, Baroda, Broach, and all those places.

14,172. All the country south?—Yes. At that time there was no plague north of Anand, and the camp was started with a view to keep it south, if possible.

14,173. It was not to examine or detain passengers proceeding towards Bombay?—No.

14,174. What was the period of detention?—It varied. At first it was only for six hours for disinfection, and then it was extended to 24 hours, then 48 hours, and then three days, and four days, and ultimately it was extended to 10 days.

14,175. Was every person proceeding from the Bombay direction detained?—Every person coming from an infected locality was detained for ten days with certain exceptions. At first, agreeably to instructions conveyed in the Plague Commissioner's letter, each train was entirely emptied and all the persons, with the exceptions noted below, were detained for inspection and disinfection, after which all who were not considered suspicious proceeded by the next train. The exceptions were modified from time to time, and ultimately stood as follows:—

(*a.*) Europeans.
(*b*) Government servants, or servants of a Native State travelling on duty.
(*c.*) Railway servants travelling on duty.
(*d,*) Persons holding certificates showing that they came direct from an authorised camp of detention where they had been under observation for at least a period of 10 days.
(*e.*) Persons holding such passes as were from to time notified by the Plague Commissioner as conferring exemption from detention.
(*f.*) Persons giving satisfactory proof that they had proceeded from uninfected localities of which they were residents.

14,176. How many people did you usually have in the camps at any one time?—At first it was only a disinfection camp, and we did not have more than three or four hundred. But when the detention was extended to 10 days we had as many as five or six thousand.

14,177. What is the total number of people you examined?—I have not the exact statistics because they are in the office in Anand, but, roughly speaking, 58,000 were detained up to the 27th May, when it was closed as a detention camp. Practically the whole train was emptied out and detained; the persons who came within the exceptions mentioned were very few.

14,178. How many of those 58,000 people afterwards developed the plague?—The total number of plague cases treated in camp was 78.

14,179. All those cases had acquired the infection elsewhere than in the camp?—Yes.

14,180. Had you any infections acquired in the camp?—No.

14,181. (*Dr. Ruffer.*) Is this the same camp as Dr. Mody spoke of?—Yes.

14,182. (*The President.*) Did your observations throw any light upon the incubation period of plague?—The only light that can be thrown is, of course, from the figures showing the day after arrival in camp on which the first symptons of plague were discovered.

Out of the 78 cases, 32 were detected within 24 hours.

1	case was detected	on the	2nd	day.
17	cases were	,, ,,	3rd	,,
9	,,	,, ,,	4th	,,
7	,,	,, ,,	5th	,,
1	case was	,, ,,	6th	,,
6	cases were	,, ,,	7th	,,
2	,,	,, ,,	8th	,,
1	case was	,, ,,	9th	,,
1	,,	,, ,,	10th	,,
1	,,	,, ,,	11th	,,

14,183. You do not know when or where any of these persons acquired the infection?—The only thing we could know for certain was the station where they came from.

14,184. Then that does not throw much light on the period of incubation?—No.

14,185. Had you many deaths among the plague cases in your camp?—I have not the figures.

14,186. Did you happen to detain persons who appeared to be ill, but did not afterwards show symptoms of plague?—Yes.

14,187. What kind of illness do you refer to?—I have a statement showing the number of deaths which took place in camp from causes other than plague. Altogether there were 32.

1	from	bronchial pneumonia.
9	,,	phthisis.
2	,,	ague.
3	,,	diarrhœa.
1	,,	fatty degeneration of the heart.
5	,,	remittent fever.
5	,,	general debility.
2	,,	asthma.
1	,,	jaundice.
1	,,	pleurisy.
1	,,	cerebral apoplexy, and
1	,,	whooping cough.

Out of these I could not tell exactly how many had any illness at the time of their being intercepted in the train, but certainly a good many had. They usually had fever, and the Medical Officer in charge could not say for certain whether that fever was due to plague or any other disease.

14,188. Do you mean in relation to those 78 cases which you have spoken of that there was a certain number of suspicious cases among them regarding whom you were not sure whether they were suffering from plague or not?—At the time of their detention it was not known, but ultimately it was ascertained that they were not cases of plague.

14,189. What are the advantages of detention?—Detention, when thoroughly carried out, is certain to prevent the importation of plague beyond the camp.

14,190. If you had failed to detain the 78 people, your inference is that the plague would have been spread to other places?—Yes.

14,191. Probably they would have become the foci of infection?—Yes.

14,192. (*Dr. Ruffer.*) Was there any other station near where the camp was established?—Yes.

14,193. What prevented people getting out at the station and going into the town?—First of all we made arrangements with the railway company to prevent any booking to the other station, namely the station of Navli. At the station immediately to the south of that there was another subsidiary observation camp, and every person getting out at that station was detained for 10 days. South of that there was a cordon, so that anybody getting out to the south of that station had to pass this Mahi cordon.

14,194. How many men were there in the cordon?—There were 50 or 60 nakas and a man at each naka.

14,195. How many miles?—From 80 to 90 miles.

14,196. Do you think that 60 men spread over 80 to 90 miles could prevent people passing through?—The river was not fordable except at certain places.

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14,197. What prevented them getting over by boats?—By arrangement with the district authorities the boats were all attached on both sides, that is to say, the ferrymen were not allowed to ply their boats except by permission.

14,198. But at night?—There were the policemen.

14,199. How many men to each naka? Supposing you take the length of the river at 100 miles, at what distance from one another were the men placed? Were they within half a mile of one another or two miles?—In some cases a mile apart. I do not think there was any naka which was nearer to another than a mile. Of course there were mounted police always patrolling.

14,200. (*Mr. Cumine.*) As a matter of fact plague has got through the cordon, has it not?—Since the cordon was relaxed, but not before. The cordon was relaxed in May and the plague got into Umreth at the end of September.

14,201. (*The President.*) But even supposing one or two cases got through, the success in detaining several was, of course, beneficial?—Yes.

(Witness withdrew.)

Adjourned till Friday, 3rd February, at Baroda.)

At The College Hall, Baroda.

FORTIETH DAY.

Friday, 3rd February 1899.

PRESENT:

PROF. T. R. FRASER, M.D., L.L.D., F.R.S. (*President*).

Mr. A. CUMINE. | Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Hosp.-Assist. P. D. Cooper.

3 Feb. 1899.

Mr. P. D. COOPER called and examined.

14,202. (*The President.*) You are a Hospital Assistant?—Yes.

14,203. What are your medical qualifications?—Qualification of Hospital Assistant of the Bombay Medical College. I have no diploma.

14,204. (*Mr. Cumine.*) The town you have come to tell us about is Ankleshwar, in the Broach District, is it not?—Yes.

14,205. What is the population of Ankleshwar?—10,692.

14,206. After having several reported cases, in what month did indigenous plague arise?—It first commenced in the month of April 1898.

14,207. How was infection brought in?—By human agency.

14,208. From where?—From Chandod.

14,209. Which was the first caste attacked?—The Ganchi caste.

14,210. How many cases were there in April?—Six; in May there was one, in June two, in July 21, and in August 191 cases.

14,211. Was it worst in August?—Yes.

14,212. By what day did it cease?—Since the 4th of November it has ceased.

14,213. It seems, then, to have ceased at the beginning of the cold weather; at the very time when, in so many other places, plague is getting worse?—Yes.

14,214. Will you put in a statement showing the weekly attacks and deaths?—I hand in statements regarding the epidemic in Ankleshwar and the neighbouring villages in the Ankleshwar taluka—there was also plague in villages of the Hansot taluka, nctably Kantiajal (where 34 deaths were recorded from the week ending on the 10th August to that ending on the 5th October, with another death in the week ending on the 9th November, making 35 in all) and Samli (where, in the period from the week ending on the 7th September, to that ending on the 26 October, 15 deaths from plague were recorded), but I have not similar statements for that taluka:—

RETURN showing WEEKLY ATTACKS and DEATHS by PLAGUE in the Town of ANKLESHWAR, in the Year 1898.

Name of Town.	Week ending—	Attacks.	Deaths.
Ankleshwar	12- 4-98 to 18- 4-98	3	1
	19- 4-98 to 25- 4-98	2	2
	26- 4-98 to 2- 5-98	1	1
	3- 5-98 to 9- 5-98	0	0
	10- 5-98 to 16- 5-98	0	0
	17- 5-98 to 23- 5-98	1	1
	24- 5-98 to 30- 5-98	0	0
	31- 5-98 to 6- 6-98	0	0
	7- 6-98 to 13- 6-98	0	0
	14- 6-98 to 20- 6-98	0	0
	21- 6-98 to 27- 6-98	2	2
	28- 6-98 to 4- 7-98	0	0
	5- 7-98 to 11- 7-98	0	0
	12- 7-98 to 18- 7-98	1	1
	19- 7-98 to 25- 7-98	13	4
	26- 7-98 to 1- 8-98	9	6
	2- 8-98 to 8- 8-98	35	23
	9- 8-98 to 15- 8-98	52	39
	16- 8-98 to 22- 8-98	38	25
	23- 8-98 to 29- 9-98	52	38
	30- 8-98 to 5- 9-98	43	37
	6- 9-98 to 12- 9-98	46	32
	13- 9-98 to 19- 9-98	17	15
	20- 9-98 to 26- 9-98	5	5
	27- 9-98 to 3-10-98	4	5
	4-10-98 to 10-10-98	3	4
	11-10-98 to 17-10-98	1	1
	18-10-98 to 24-10-98	0	1
	25-10-98 to 31-10-98	1	1
	1-11-98 to 7-11-98	2	1
	Total	331	245

RETURN showing WEEKLY ATTACKS and DEATHS by PLAGUE in the Villages of the TALUKA OF ANKLESHWAR during the Year 1898.

Names of Villages.	Week ending—	Attacks.	Deaths.
	ANKLESHWAR TALUKA.		
Avadur	10- 9-98 to 16- 9-98	2	1
	17- 9-98 to 23- 9-98	1	1
	24- 9-98 to 30- 9-98	1	1
	Total	4	3
Umarwada	12- 8-98 to 18- 9-98	6	4
	19- 9-98 to 25- 9-98	0	0
	26- 9-98 to 2-10-98	2	1
	3-10-98 to 9-10-98	4	3
	Total	12	8
Divi	30- 9-98 to 6-10-98	3	1
	7-10-98 to 13-10-98	1	0
	Total	4	1
Bhadkodra	5-10-98 to 11-10-98	6	3
	12-10-98 to 18-10-98	5	5
	Total	11	8
Piraman	17-10-98 to 23 10-98	2	1
	Total	2	1
Diwa	18-10-98 to 24-10-98	5	3
	25-10-98 to 31-10-98	10	8
	1-11-98 to 7-11-98	3	0
	8-11-98 to 14-11-98	2	2
	15-11-98 to 21-11-98	1	0
	22-11-98 to 28-11-98	0	0
	29-11-98 to 5-12-98	0	0
	6-12-98 to 12-12-98	3	3
	Total	24	16
Samore	20-10-98 to 26-10-98	7	1
	27-10-98 to 2-11-98	0	1
	3-11-98 to 9-11-98	0	0
	10-11-98 to 16-11-98	1	0
	Tota	8	2
Kosumbdi	22-10-98 to 28-10-98	1	0
	Total	1	0
Chhapra	25-10-98 to 31-10-98	4	0
	1-11-98 to 7-11-98	2	2
	8-11-98 to 14-11-98	0	0
	15-11-98 to 21-11-98	1	1
	Total	7	3
Nagal	29-10-98 to 4-11-98	3	3
	5-11-98 to 11-11-98	1	1
	12-11-98 to 18-11-98	1	0
	19-11-98 to 25-11-98	1	1
	26-11-98 to 2-12-98	1	1
	Total	7	6
Amboli	4-11-98 to 10-11-98	5	2
	11-11-98 to 17-11-98	1	1
	18-11-98 to 24-11-98	0	1
	Total	6	4
Pungaum	8-11-98 to 14-11-98	1	1
	Total	1	1
Mandva Buzurg.	19-11-98 to 25-11-98	1	1
	26-11-98 to 2-12-98	1	0
	3-12-98 to 9-12-98	1	1
	10-12-98 to 16-12-98	0	0
	17-12-98 to 23-12-98	1	1
	24-12-98 to 30-12-98	2	1
	Total	6	4
Boidra	30-11-98 to 6-12-98	2	1
	7-12-98 to 13-12-98	1	1
	14-12-98 to 20-12-98	0	1
	Total	3	3
	Grand Total	96	60

14,215. Could you also tell us the admissions and attacks in the segregation camps, showing in each case the number of days that elapsed between the admission into camp and the development of the disease?—A statement showing the number of admissions and attacks is put in by me, as follows:—

STATEMENT showing ADMISSIONS in the SEGREGATION CAMP, and PLAGUE ATTACKS amongst them, and the NUMBER of DAYS after ADMISSION that each was attacked in the Town of ANKLESHWAR.

Total Admission into the Segregation Camp was	No.	Names of Persons Attacked.	Sex. M.	Sex. F.	Sex. C.	Age.	Occupation.	Date of Admission into the Segregation Camp.	Date of Attack.	No. of Days after Admission.	Result. Recovered.	Result. Died.
1,627	1	Ghella Trimbuk	1	—	—	55	Beggar	30-8-98	1-9-98	2 days	—	1-9-98
	2	Mancha Nageshar	—	1	—	45	Nil	1-8-98	1-9-98	1 month	23-9-98	—
	3	Chandi Gangaram	—	1	—	16	„	19-8-98	24-8-98	5 days	—	11-9-98
	4	Mani Gangaram	—	1	—	38	„	19-8-98	24-8-98	„	26-9-98	—
	5	Sorabjee Bamanjee	1	—	—	17	Farmer	7-8-98	12-8-98	„	11-9-98	—
	6	Amrat Jamna	—	1	—	28	Nil	4-8-98	12-8-98	11 days	31-8-98	—
	7	Bhagnan Govan	1	—	—	18	Tailor	11-8-98	16-8-98	5 „	11-9-98	—
	8	Bai Jinni Gojia	—	1	—	30	Nil	19-8-98	26-8-98	7 „	—	27-8-98

14,216. How did plague appear to spread in the town? Did it appear to be carried by human agency, or to go to the house next door?—In the commencement by human agency, and afterwards from door to door by contact cases.

14,217. Did you notice any cases where, on a house becoming infected, the house immediately behind it, which had no communication with it, became infected? —Yes, I have noticed many cases immediately behind an infected house, which seemed to have had no communication with that infected house.

14,218. Did you have house to house searchings in order to discover the plague cases?—Yes.

14,219. What was the effect of that? Did it have a good effect, or did it lead to concealment?—It had a good effect.

14,220. I suppose you had the ordinary measures of removal of plague patients to hospital, and segregation of contacts?—Yes.

14,221. Did that stop the plague in the town, or had you to resort to evacuation?—We had to resort to evacuation.

14,222. By what date was the town totally evacuated? —By the 23rd of August.

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14,223. What was the effect of that on the plague? Did the plague get worse after evacuation, or did it decrease?—It decreased.

14,224. At the time of taking the people out, did you disinfect their clothes?—Yes, clothes, furniture, and everything, of those who were segregated into the health camps, and of those who left the town with our permission and passes; but not of those who voluntarily removed themselves to sheds and huts erected by them.

14,225. After they had been evacuated, did you allow them to go to their work in the day time?—Sometimes they would take materials from their households, after putting them in the sun and disinfecting them.

14,226. During the day, were they free to go to their ordinary occupations?—Yes, some of them came into the town.

14,227. Did you shut them all up with a police guard, so as to prevent them going out to their ordinary occupations, or were they free to do so?—They were given passes, and after one or two days they were allowed to go into their houses and open the windows and doors.

14,228. How did they earn their bread?—The Municipality maintained those that were poor.

14,229. How did you prevent them from sleeping in their houses at night?—By the police guard.

14,230. Did you find any cases where people got infected by secretly sleeping at their houses at night?—Yes, several of those cases were found.

14,231. When cases occurred amongst the evacuated people in the huts outside the town, did infection spread much from them to the other people in the huts?—Not much.

14,232. When were the people allowed to return to their houses?—At the end of October.

14,233. Was there any recrudescence on their return?—No.

14,234. Had all the houses in the town been disinfected with perchloride of mercury or only those houses in which you thought plague cases had occurred?—Only the streets in which plague cases had occurred were disinfected.

14,235. What were those streets disinfected with?—Perchloride of mercury and hydrochloric acid.

14,236. Were the other streets disinfected with anything?—The other streets were not disinfected.

14,237. Did you notice any cases where people who went to whitewash houses that had been disinfected with perchloride of mercury were attacked by plague?—Two or three coolies and firemen who went to disinfect the houses with perchloride of mercury died. From disinfecting houses they got plague—three or four cases—but from whitewashing not a single case was noticed.

14,238. Did the people co-operate with you in the early stage of the epidemic?—No.

14,239. Did they co-operate with you in the later stage of the epidemic?—Yes.

14,240. In what way?—By taking medicine from the dispensaries, and also by coming for treatment. In the commencement they did not take plague treatment at all for plague cases, but after the month of August they found a lot of plague cases, so they took treatment.

14,241. Did they co-operate with you in pointing out infected people to you?—Very rarely.

14,242. Did you notice that the virulence of the plague germ decreased as the epidemic was dying out—that fewer people attacked died?—Very few of the people attacked in the months of October and November died.

14,243. Have you any facts to tell us regarding animals, such as fleas, monkeys, and squirrels catching plague?—Many monkeys, rats, and squirrels died of plague.

14,244. Did you send any of the bodies, or any of the blood of these animals, to be bacteriologically examined?—No.

14,245. Did you examine any of the bodies?—No.

14,246. Have you any figures to give us regarding inoculation?—Yes. The figures of inoculations performed by me are as follows:—

STATEMENT showing the NUMBER of INOCULATIONS performed at ANKLESHWAR and other VILLAGES with M. HAFFKINE'S PLAGUE PROPHYLACTIC: distinguishing between First and Second Inoculation.

——	Under 5 Years.	Over 5 Years of Age and under 60.	Over 60 Years of Age.	Name of Village or Town.	No. Inoculation.	Plague Inoculated.	Deaths from Plague Uninoculated.	Result.	Re-inoculation.
During the year ending 31st December 1898.	3	38	1	Ankleshwar town -	42	—	—	Good	Nil
Do. do. -	—	11	—	Bhadkodra village, Taluka Ankleshwar.	11	—	—	—	—
Do. do. -	—	5	—	Soorvalli village, Taluka Ankleshwar.	5	—	—	—	—
Do do. -	5	60	1	Ilao village, Taluka Hansot.	66	—	—	—	—
Do. do. -	26	465	11	Kantiajal village, Taluka Hansot.	502	3	3	Good	—
Do. do. -	—	19	—	Samli village, Taluka Hansot.	19	1	1	—	—
Total - -	34	598	13	—	645	4	4	Good	Nil

Other doctors also performed inoculations. Thus in Kantiajal, though I did only 502 inoculations, 619 were done altogether, the inoculated numbering 21 under 5, 554 between 5 and 60, and 18 over 60. Similarly in Samli, for which my statement shows only 19 inoculations, altogether 60 people were inoculated, 5 being under 5, and 55 between 5 and 60.

14,247. Who was in supreme charge of plague?—Khan Bahadur Sorabshaw Hormusji, the District Deputy Collector.

14,248. Is he here?—No.

14,249. (*The President.*) What do these figures with regard to inoculation show?—I cannot give any positive opinion.

14,250. As far as you can say these figures lead to no satisfactory result?—I inoculated at the time the plague was dying out.

14,251. Therefore you are not convinced by these figures of the value of inoculation?—No.

14,252. (*Dr. Ruffer.*) What are Ghanchis?—Oil sellers.

14,253. How many Hindus, Muhammadans and Parsees are there in the town? Are the Hindus more numerous than the Muhammadans and Parsees?—Yes, the Hindus are more numerous.

14,254. How were they disinfected on leaving the town?—By a gang of 12 persons.

14,255. Was the clothing disinfected when the people were moved from the town into camp?—Yes.

14,256. How?—Sometimes by boiling, or putting into the carbolic acid lotion for half-an-hour.

14,257. What strength of carbolic lotion?—One in 40, for half-an-hour; and sometimes in pure boiling water on the fire.

14,258. You disinfected the houses with perchloride of mercury?—Yes.

14,259. What strength?—1 in 1000.

14,260. In an acid solution?—Yes, hydrochloric acid solution.

14,261. How was the solution prepared?—Four ounces of perchloride of mercury and eight ounces of hydrochloric acid, in one bottle, to 25 gallons of water. We prepared our solutions in bottles, one bottle being added to 25 gallons of water, giving a strength of 1 in 1000.

14,262. How was the solution applied?—By a hand-pump.

14,263. How did you disinfect leather goods; shoes, for instance?—All were disinfected with perchloride of mercury.

14,264. What measures did you take about the registration of deaths?—Without a certificate, no corpse could be taken away.

14,265. Who gave the certificate?—I did.

14,266. Anybody else?—No.

14,267. You saw every corpse that was buried?—Yes.

14,268. Did you see any cases of plague pneumonia?—Very few cases.

14,269. Did you see any cases of plague pneumonia in houses in which there had been cases of bubonic plague?—No.

14,270. Did you ever see a case of pneumonia give rise to a case of bubonic plague in another person?—No.

14,271. Did you ever see cases of plague pneumonia in the same house with a bubonic case?—No.

14,272. The cases of pneumonia were scattered all over the place?—Yes.

14,273. What measures did you take to detect plague cases?—By keeping a supervisor, who went from door to door daily, and by taking a roll-call, and if they found any sickness they sent me a report, and I went to see them.

14,274. There was a roll-call of the town every day?—Yes, a daily roll-call.

14,275. How many people were there in the town?—Ten thousand six hundred and ninety-two people in the town, and about 16 supervisors and six superintendents.

14,276. Were these supervisors medical men?—No, schoolmasters.

14,277. How could they detect a case of plague?—They only recorded whether any persons were sick or not. If they found a person sick they sent a report to me.

14,278. And then you went to see them?—Yes.

14,279. And you found you could see every sick case in the town; did you see every one of them?—Some of them, not all.

14,280. So that a certain number of people died without having been seen?—Yes.

14,281. Did you see every corpse?—Yes, I and medical officers saw them. After the month of August, three medical officers came from Bombay.

14,282. And they saw all the dead bodies?—Yes.

14,283. But a great many people died without having been seen during life by medical men?—Yes.

14,284. May not some of these cases have died of pneumonia plague without the diagnosis having been made?—There were very few cases of pneumonic plague.

14,285. But how could you see that these people had not died of pneumonic plague?—After death we could not say.

14,286. You removed the sick to the Plague Hospital?—Yes.

14,287. Did you remove all the sick whether they were dying or not?—A serious case in a dying state we did not remove.

14,288. How did you isolate the contacts?—By putting them in a Dharamsala camp—a big place near the station.

14,289. Who was in charge of the camp?—Mr. Luloobhy.

14,290. Was he a medical man?—No, a graduate.

14,291. Who saw the contacts every day, besides him?—The Medical Officer.

14,292. Did you have any cases of sudden deaths in the contact camp?—One or two.

14,293. Who died without being seen?—Yes.

14,294. What did they die of?—One died of plague

14,295. Do you think that you saw every dead body in the contact camp, or do you think they were able to get rid of some of them without being seen?—We saw the dead bodies in the camp and in the houses also.

14,296. Do you think that occasionally a dead body was burnt without it being seen?—They were not burnt without notice, that is our strict rule.

14,297. Did you have a watch on the burning and burial grounds in the town?—Yes, they are outside the town.

14,298. Who watched these grounds?—Peons and pattawalas.

14,299. How did you burn the ground floors when you disinfected the houses?—By kerosine oil on the channa (cakes of cow dung), and burning the ground after it was dug out.

14,300. Did you find that an efficient method?—We cannot say, because no plague has occurred since.

14,301. Is it a difficult method to apply, does it take a long time and is it expensive?—Yes.

14,302. You say in your précis that you disinfect houses with nitro-oxide gas?—Yes, we used it because it is a germicide.

14,303. I am not sure that I know what you mean by nitro-oxide gas. Can you tell me how it is prepared?—With about 8 ounces of pure nitric acid and 2 tolas of copper filings.

14,304. Have you any evidence to show that nitro-oxide gas is a disinfectant?—No.

14,305. Then you use it on general principles?—Yes, on general principles.

14,306. How do you prepare the lime whitewash that you used for the houses?—Simply lime and water.

14,307. What sort of lime did you use?—Quicklime.

14,308. Did you test the lime in any way to see that it was efficient?—No.

14,309. When you used quicklime as a disinfectant, you dissolved it as far as possible in water?—Yes.

14,310. How soon after making that solution did you apply it as a disinfectant?—After two or three hours.

14,311. Did you see any cases of malignant plague?—No.

14,312. You say in your précis: "This is the most "severe type of the disease, and is accompanied by "subcutaneous petechiæ and hæmorrhages." Have you seen any cases of that sort?—No.

14,313. Did you ever see any cases resembling that after death?—No.

14,314. Did you find that the people who came to be inoculated were of the better classes?—No, the ordinary classes, principally the low class cultivator.

14,315. Did you see any bad effects from the inoculations?—No.

14,316. Did you take the temperatures after inoculation?—I did not take them, but other Hospital Assistants did. I only went there for two or three days.

14,317. You did not do the inoculations yourself?—Yes, I did them myself.

14,318. Did you ever see any abscesses after inoculation?—No.

14,319. Did you ever see high fever after inoculation?—Not more than 103.

14,320. Do you know of anyone dying within one or two days after inoculation?—No.

14,321. (*The President.*) At Kantiajal you did 500 inoculations?—Yes.

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14,322. Did any of those persons take plague afterwards?—Only three persons at Kantiajal, and one at Samli village.

14,323. Can you tell me how soon after inoculation each of these cases occurred?—The statements are as follows:—

STATEMENT showing Particulars in Connection with Four Persons who died of PLAGUE though Inoculated, in the Villages of SAMLI and KANTIAJAL in HANSOT MABAL.

Register No.	Name with Father's Name.	Resident of what Village.	Age.	Race or Caste.	Occupation.	Date of Inoculation.	By whom Inoculated.	Dose. Fluid used was Two Times the Standard Dose.	Date of Attack.	Date of Death.	Appearance of Bubo.	Remarks.
39	Koya Lalla - -	Samli	39	Koli	Farming	19-9-98	Dr. P. D. Cooper	4 c.c.	18-10-98	19-10-98	Bubo in the left groin.	Two times the standard dose.
45	Motiram Hargovand.	Kantiajal	15	"	"	"	" "	2½ c.c.	1-11-98	3-11-98	Bubo in the right groin.	
58	Mancuhd Jivram	"	15	"	Nil	"	" "	2½ c.c.	4-10-98	5-10-98	No bubo	
92	Govind Popat -	"	18	"	Farming	"	" "	3½ c.c.	25- 9-98	25- 9-98	Bubo in the right arm-pit.	

14,324. (*Mr. Cumine.*) When the people had gone out of the town into huts, how did you ascertain whether plague cases were occurring amongst the people in the huts?—By the daily roll-call, and search parties.

14,325. Had you any police guard over the segregation camp in order to prevent the people from escaping?—Yes.

14,326. Whilst the people were still in the town you had house to house searchings, had you not?—Yes.

14,327. You say that the effect of that was good?—Yes.

14,328. How was it good?—Because we were finding plague cases by our searching measures, and the people were not concealing any cases.

14,329. Did they attempt to conceal?—Yes, at the commencement they attempted to conceal the cases.

14,330. Were sick people removed from one house to another?—Very few.

(Witness withdrew.)

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Mr. R. J. PETIGARA called and examined.

14,331. (*The President.*) You are an Assistant Surgeon?—Yes.

14,332. What are your medical qualifications?—I am a Licentiate of Medicine and Surgery of the Bombay University.

14,333. You have been on plague duty in the Broach District?—Yes, in the Thana District and in the Ankleshwar town of the Broach District.

14,334. And also in the taluka?—Yes, in the Ankleshwar taluka.

14,335. You had anticipated plague because of its occurrence elsewhere?—Yes.

14,336. What measures did you take to prevent the introduction of plague into the Broach District?—As soon as plague broke out in Bombay, the Collector saw the danger of it, and he maintained a frontier guard, by means of which all the public roads and entrances into all the villages and all the railway stations were guarded to prevent the importation of any plague cases from outside, as well as to prevent the entrance of all persons who had not been in quarantine for 10 days. It was on account of this frontier guard that the immunity of plague in the Broach District was due for a very long time—until the month of April 1898—otherwise it would have suffered from plague long ago.

14,337. When did you commence these precautions?—In the month of December 1896.

14,338. Up till what date did the Broach District remain free from plague?—Until April of 1898.

14,339. When did the imported cases occur?—Cases were imported in the year 1897, but they were all promptly detected and isolated. The local cases in Ankleshwar town were detected only in the month of April 1898.

14,340. Were you able to trace the importation in each case?—Mostly.

14,341. You knew from what town or locality the persons had come?—Yes.

14,342. And in each case it was from a plague-infected area?—Yes.

14,343. You got indigenous cases subsequently?—Yes.

14,344. Were they traced to importation distinctly?—Yes, distinctly to importation.

14,345. You thought the importation was effected by human agency?—Yes.

14,346. Both by persons and by clothing?—Yes.

14,347. How did you distinguish between the person and the clothing?—At Ankleshwar town I know of an instance where a plague case was detected. The party had gone in for disinfection purposes; but, strange to say, no clothes or bedding were found there for disinfection. The family in question was a wealthy family, and it was thought that the clothing or bedding was secreted in another street. Due warning was given to the people, but they did not take any notice of it, and they persisted in secreting. Afterwards the clothing and bedding were traced to two streets in Samli and Piplakhidki. From inquiries made it was subsequently proved conclusively that the bedding and the clothing belonged to the identical family where the case was detected. There were no plague cases in those two streets before, and it is supposed that the infected bedding caused the spread of infection in those streets; and gave rise to plague cases.

14,348. Was there no possibility of these persons having contracted plague by having come in contact with plague patients?—Such a thing has never been proved.

14,349. In the cases you have referred to did you make it quite certain that the persons could not have come into contact with plague cases?—No, they did not come in contact with plague cases, that is certain.

14,350. Were there no plague cases in the neighbourhood?—There was plague in the neighbourhood, wherefrom they brought in the clothing and the bedding.

14,351. One case?—One case only.

14,352. Could these persons not have visited that patient?—No.

14,353. Why not?—Because inquiry showed that they had not visited that sick patient at all. In some cases the mere mention of a plague case is a dread to other people, and they do not mix up indiscriminately.

14,354. In these cases they did not attend the plague patient. Where the clothes appeared to have conveyed the disease the persons affected, as you suppose by the clothes, could not possibly have come in contact with the plague patient?—No, I am quite certain of that.

14,355. How many cases occurred in which infection was conveyed by these clothes?—Seven in one place and nine in another place.

14,356. Were these seven in one house and the nine in another house, or how were they distributed?—They

were not in one house; they were confined to two or three adjacent houses. These seven and nine cases are for the streets, and not for the particular houses.

14,357. Did each of these several houses in any one street get parts of the clothing of this one man, or how was it distributed?—The plague cases occurred in the houses in which the bedding and clothing were secreted, but in the adjacent houses the infection appears to have spread.

14,358. Have you any other instances in which you think that clothing and not the person carried the disease?—No.

14,359. That is the only clear case to your mind?—Yes.

14,360. Did rats appear to carry the disease?—Yes.

14,361. They extended it where the disease already was present, I suppose?—No; rats appeared to die at a place, and then they gave the disease in an area in which there were no plague cases before, or in isolated houses which were far away from the infected villages and towns.

14,362. That is one method by which the plague was spread by rats, and it was carried a long way?—Yes.

14,363. Can you give some examples of that?—While I was a travelling Medical Inspector in the Satara District, near the railway station of Karad, there was a masonry building utilised as a Post Office. This Post Office was over two miles from the village of Karad, where the plague was raging. There were no plague cases in the vicinity of Karad station; it was altogether an uninfected area. One day two dead rats were found. The Postmaster would not take any notice. Another day two more dead rats were found, and on the fourth day after the first appearance of the dead rats, the daughter of the Postmaster contracted plague and died. There was another plague seizure in the same house, hence two daughters contracted plague in the same family.

14,364. About the same time?—At an interval of one or two days.

14,365. The first one contracted it four days after two dead rats had appeared?—Yes.

14,366. How did you exclude infection by human agency or by clothes?—Because the family in question was not such as to come in contact with any plague cases, nor would admit any outsider into their family.

14,367. Why?—Because they were Deccan Brahmans, and they knew the virulence of the disease quite well. They were completely on their guard. They would neither admit an outsider nor come in contact with a plague patient.

14,368. There was a case of plague?—Yes.

14,369. And necessarily a large number of people must have come to this house, as it was a Post Office?—Yes, but they had no access to the family members.

14,370. Where did the people go to who came for stamps?—They must have done their business with the Postmaster, which being done, the party must have departed.

14,371. In the house or not in the house?—Not in the house.

14,372. Where was it?—In the Post Office itself; the family was putting up with the Postmaster. If any outsiders came to do business at the Post Office, they must have done business with the Postmaster only.

14,373. You say the Postmaster lived in this place with his family; he must have done his business somewhere—where did he do it?—At the same house.

14,374. How could you say it was impossible for people who were infected to have conveyed the disease to any of the inmates of that house?—Because the outsider had no access to the household members.

14,375. He had access to the house; was the Post Office in a room to which the members of the family had access?—It was.

14,376. How was that?—Because at that Post Office the business was managed only on the verandah, which was all open to sunlight and air.

14,377. Have you any other case in which rats appear to have carried plague to a considerable distance?—The case I am now going to recite gives a probability that the rats might have conveyed the poison. It was in this way. I was on plague duty at a village called Utan and plague appears to have broken out at Bhaynder. On inquiry into the cause of plague at Bhaynder, no importation of plague from outside could be traced, but dead rats were found at Bhaynder, and at a village called Doongri at the same time. There were no plague cases at Doongri, even though dead rats were found, but after the appearance of dead rats at Bhaynder, plague cases originated there. The inference drawn was that rats appeared to have carried it to Bhaynder *viâ* Doongri, but plague did not originate at Doongri though it did at Bhaynder.

14,378. Where was the nearest infected area?—Utan.

14,379. How far away is that?—Nearly five miles.

14,380. And nothing significant preceded the attack in this village excepting the death of some rats?—That is so.

14,381. Have you any other cases?—No.

14,382. What steps were taken to ascertain whether these rats died of plague or not?—The Assistant Collector who was there investigated the matter and reported fully on it to the Government, but I have no knowledge by whom and when these rats were examined. As a rule the appearance of dead rats in numbers is a known sign everywhere that they died of plague. If there were single solitary rats, it would be a different thing.

14,383. You do not know whether a bacteriological examination was made?—No.

14,384. Then in Ankleshwar the plague remained dormant for some time?—Yes, in May and June.

14,385. And it broke out in July, did it not?—Yes.

14,386. How do you account for this dormancy?—Here, again, is a probability, and no one can say with certainty. It was summer time. In May, and nearly for the greater part of June, at that place, when it is too hot, it is the habit of the native people to sleep and lie outside and not indoors. Remaining out always exposes people to a purer and a dryer air, unlike in houses where the atmosphere is much vitiated, and where, perhaps, the people might be subjected to the influence of plague poison which might be accidentally brought there by means of rats or anything.

14,387. During the hot weather they were to all intents and purposes in camp?—Yes. They always sleep outside because they find it too close and hot inside.

14,388. What were the most favourable conditions inside the dwellings that you have encountered for the propagation and the extension of plague?—Especially the want of ventilation, overcrowding, and the way in which the houses inside are kept clean. They are generally ill-ventilated, overcrowded, and very dirty. Those are the factors in propagating the disease.

14,389. Had you in this place any houses which were not overcrowded and which were well ventilated, but which became infected?—At times plague rages in those houses also.

14,390. Then how do you account for what you have just stated?—It is probable in these cases that they came in contact with a plague patient or they visited the infected areas. By frequent visits to infected areas, perhaps they conveyed the disease to their houses which are freely ventilated, and often solitary too. While I was at a village called Saloli in the Bassein taluka, the village was nothing but a group of vegetable gardens—there were no houses side by side so that you might call it a village. They were distant houses, each garden containing one house, or two or three houses at the most in one garden. In such solitary houses where there was no overcrowding, I have seen plague prevailing, and it is probable that these vegetable sellers, who were frequenting Bassein for the purpose of selling their vegetables, got plague from that town.

14,391. Why should it have spread in these well-ventilated and not overcrowded houses, if bad ventilation and overcrowding are the important factors in spreading plague?—I mean that they conveyed the plague into their houses. At such places one or two cases occur only and then the plague dies out; it does not spread so much as it does elsewhere.

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14,392. You mean there is a great difference in the intensity of plague in ill-ventilated, overcrowded houses and well-ventilated houses?—Yes.

14,393. How many plague cases had you at Ankleshwar?—331 in all.

14,394. You have analysed these cases in regard to the age incidence of plague, have not you?—Yes. I have prepared a table which is as follows:—

Ages.	Number of Plague Cases.	Population according to last Census.	Attacks per 1,000.
Up to 5 years - -	7	1,358	5·15
From 6 to 10 years -	30	1,345	22·30
„ 11 to 15 „ -	39	948	41·13
„ 16 to 20 „ -	37	841	43·99
„ 21 to 25 „ -	40	1,171	34·15
„ 26 to 30 „ -	37	1,055	35·13
„ 31 to 40 „ -	68	6,434	41·61
„ 41 to 50 „ -	41	1,131	36·25
„ 51 to 60 „ -	22	695	31·65
61 years and above -	10	516	19·37

14,395. What have you found was the period of life which was chiefly immune from plague?—Chiefly childhood. Children do get it, however, but the percentage of attacks in children is much less than in others.

14,396. What measures do you adopt in this place for treating the epidemic?—Evacuation, which is the best and surest remedy.

14,397. In Ankleshwar, what did you do?—In Ankleshwar the practice adopted was partial evacuation.

14,398. Will you tell us what was done exactly?—The inhabitants of the streets where cases had occurred were completely put out into the fields. In this way the three worst infected streets were evacuated. Search parties were instituted to carry on investigations and for finding out concealed plague cases in the town. Even though the search parties did succeed in finding out concealed cases, the results were not encouraging. The disease went on its own course. Even though it was during the monsoons, it was thought desirable to put out the whole town of Ankleshwar into the fields.

14,399. Was it the wet season?—Yes.

14,400. Rainy?—The Gujarat side has no heavy monsoon.

14,401. What was the sort of climate during the monsoon?—It was wet.

14,402. Notwithstanding that it was rainy, you still turned the people out, completely evacuated the houses?—Yes.

14,403. What was the result?—The result was that before a month had elapsed plague had practically ceased.

14,404. Have you any figures which will show what was the result of partial evacuation, and the result of complete evacuation? Do you know how many cases were occurring in the town before complete evacuation was effected?—The work of evacuation was commenced on the 15th of August, and was over on the 23rd of that month, and I think the following statement will give you the necessary information:—

STATEMENT showing the NUMBER of PLAGUE CASES and of DEATHS from April to November 1898, in ANKLESHWAR TOWN.

Dates.	April.		May.		June.		July.		August.		September.		October.		November.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
1	—	—	—	—	—	—	—	—	2	—	5	5	—	2	—	—
2	—	—	—	—	—	—	—	—	4	1	5	4	—	1	—	—
3	—	—	—	—	—	—	—	—	2	4	3	2	—	—	2	—
4	—	—	—	—	—	—	—	—	3	4	8	7	1	—	—	—
5	—	—	—	—	—	—	—	—	6	3	1	5	—	1	—	—
6	—	—	—	—	—	—	—	—	5	4	7	4	—	—	—	—
7	—	—	—	—	—	—	—	—	7	4	6	5	1	2	—	1
8	—	—	—	—	—	—	—	—	8	3	9	6	—	—	—	—
9	—	—	—	—	—	—	—	—	11	5	11	7	—	1	—	—
10	—	—	—	—	—	—	—	—	12	7	6	5	1	—	—	—
11	—	—	—	—	—	—	—	—	6	7	3	4	1	—	—	—
12	1	—	—	—	—	—	—	—	8	3	4	4	—	1	—	—
13	—	—	—	—	—	—	1	—	8	6	7	4	—	—	—	—
14	1	—	—	—	—	—	—	—	4	9	3	3	—	—	—	—
15	1	—	—	—	—	—	—	1	3	2	1	1	—	—	—	—
16	—	—	—	—	—	—	—	—	5	1	1	3	—	—	—	—
17	—	—	—	—	—	—	—	—	4	2	—	1	—	—	—	—
18	—	1	—	—	—	—	—	—	3	6	4	1	—	—	—	—
19	—	1	1	—	—	—	2	—	8	3	1	2	—	—	—	—
20	1	—	—	—	—	—	3	—	9	3	2	2	—	—	—	—
21	—	—	—	1	—	—	1	—	4	5	—	—	—	—	—	—
22	—	—	—	—	2	—	—	1	5	5	2	—	—	—	—	—
23	—	1	—	—	—	—	2	1	8	4	—	1	—	1	—	—
24	1	—	—	—	—	1	4	1	9	5	—	1	—	—	—	—
25	—	—	—	—	—	—	1	1	9	8	1	1	1	—	—	—
26	1	—	—	—	—	1	1	2	7	7	—	—	—	—	—	—
27	—	—	—	—	—	—	—	2	5	5	2	—	—	—	—	—
28	—	—	—	—	—	—	2	1	6	4	1	1	—	—	—	—
29	—	—	—	—	—	—	2	—	8	5	1	1	—	—	—	—
30	—	1	—	—	—	—	1	—	9	9	—	—	—	1	—	—
31	—	—	—	—	—	—	1	1	3	5	—	—	—	—	—	—
Total -	6	4	1	1	2	2	21	11	191	139	103	77	5	10	2	1
Total up to the end of month	6	4	7	5	9	7	30	18	221	157	327	237	329	244	331	245

14,405. When you partially evacuate, how do you prevent access to the town of the evacuated persons?—Such a rule is never practised elsewhere. After evacuation they are not completely shut out from having access to the town. They may come for business, otherwise it would be going to the extreme. As soon as the people are removed from the infected houses and streets, the result of evacuation is that plague cases decrease fast among those evacuated.

14,406. But any plague case from the camp, or any person ill of plague, might have access to the town, I suppose?—No, not necessarily. Such cases might have access to the town but they would be very rare.

14,407. Persons in good health in the camp might go to the town, and acquire plague there, might they not?—They might.

14,408. But notwithstanding that you found the number of cases rapidly diminished?—Yes.

14,409. But the diminution did not go to complete stoppage until you had completely evacuated?—No.

14,410. What did you do with the evacuated houses, how were they treated?—The houses where plague cases were detected before evacuation were thoroughly disinfected, together with the houses on either side, and the houses in front and behind, if they were too close. In the case of narrow streets and bad ventilation, we disinfected the whole streets. If a gali went between, sufficiently large, we stopped there; otherwise, if it was a continuous row, we disinfected the whole of it.

14,411. I suppose your disinfectant was the same as that mentioned by the last witness?—Yes, perchloride of mercury. We also dug up the floors and burnt them.

14,412. Did you ever have any cases in which persons returning to a house thus disinfected acquired plague?—Yes. I know of a case of a mounted policeman. There were two plague cases in the police lines. The whole of the police lines were put out into a better place. After going to a safer place there was no case of plague; no one after removal from the lines acquired plague in that new place. It was, however, found that a mounted policeman was still secretly visiting the police lines, and even sleeping there at night. Although he was advised by his friends not to do so, he still continued the practice, with the result that he soon after acquired plague, and died.

14,413. Is that the only case?—I know of other similar instances.

14,414. You know of other cases in which a house once disinfected was proved to be unsafe?—Yes; but this is the particular case I know.

14,415. Do you ever disinfect a house twice?—Yes; only plague-infected houses.

14,416. Do you ever have any cases in which a house twice disinfected became again a source of plague?—No.

14,417. You have given us an example of the effect upon an epidemic of partial followed by complete evacuation in one town or district?—Yes.

14,418. Have you any examples of complete evacuation having at once been adopted?—Yes.

14,419. Will you narrate such a case?—The villages of Kosumbdi, Mandva Buzurg, and Piraman are typical instances of villages where early evacuation brought about disappearance of plague. The history of each is as follows:—Kosumbdi is a large village in Ankleshwar Taluka with a population of 1,201, and it was on the 22nd October 1898 that a report first reached me that a suspicious case required to be medically examined from a plague point of view. On my going there, and verifying it as a local plague case, I gathered together all the villagers, and on my explaining to them all the advantages of plague preventive measures, they one and all consented to allow me to carry out the routine preventive measures and consequently entire evacuation with disinfection of the street where the case occurred and also of the street in front and behind was ordered; arrangements for plague operations were soon made as to isolation, segregation, daily muster-roll of all those who put up in the fields, &c., but I need hardly say that no further case of plague was detected by the men on plague duty at the village. The village was thus saved by prompt evacuation with one case only. Similar is an instance of the Piraman village. It is, however, a small village in close proximity to Ankleshwar, and the first two cases were discovered in a Borah-Musalman house on 17th and 21st October 1898 respectively, when the whole village was promply evacuated while adopting at the same time all the necessary plague measures for emergency in case of more plague attacks occurring, but here also no more plague cases were detected in any more families than the one already affected. Mandva Buzurg, which is a very large village of the taluka with a population of 2,005, had in the beginning its mortality first raised. No proper information being available, suspicion only was raised, but it was afterwards confirmed by a real plague case being detected on the 19th November 1898. A major portion of the whole village was put out, but another case occurring a little after, the whole village was put out into the fields. The most characteristic thing about Mandva Buzurg is that, in spite of its large population, when plague visited it, it should have died out so soon with such an infinitesimal number of six cases only.

14,420. What about those who were evacuated?—They did not develop plague outside in the fields.

14,421. In order to obtain these good results from prompt evacuation, what other conditions are required?—Co-operation of the people is the best thing, and there should be good work from the subordinates. Those are the essential things. The people should assist in bringing plague cases to the notice of the authorities. If this is done, the necessary isolation, segregation and disinfection are done on the spot, and the disease has little time to spread beyond.

14,422. How long do you generally keep the people out?—At Ankleshwar taluka the people have been kept out one month; I have known them kept out two months, and in some cases as long as three months. Three months is the longest period.

14,423. Why did you keep them out as long as three months?—The longer they are kept out the better. I do not know the particular reason for it, but the sooner they return to the place the more likelihood there is of the disease recurring.

14,424. Have you had any recurrence after one month's interval?—No.

14,425. So far as you have seen one month has been sufficient?—A little over one month.

14,426. A little over one month has been sufficient?—Yes.

14,427. There was no particular reason, therefore, for adopting three months?—No.

14,428. In what cases do you think partial evacuation is a good measure to adopt?—Partial evacuation is not so good as complete evacuation. With partial evacuation, though the intensity of the disease becomes much less, the disease might linger. That is a thing which I have noticed in many places.

14,429. Supposing you heard of the first cases in any large town, and succeeded in removing the inhabitants of the contiguous areas, would that be likely to be beneficial or not, if it was carried out at the very commencement of the importation?—In most cases it would.

14,430. Assuming that you obtained very early information?—Yes.

14,431. What measures did you adopt to obtain as early information as possible?—As a rule we got early information from the Health Department.

14,432. How was that done?—The Health Inspector of a place has to report when dead rats are found in a place, before plague comes, before it has visited a place.

14,433. I think you have already told us that you knew that an epidemic frequently originates by human communication before rats die in the place?—In the beginning it is very difficult to get the information.

14,434. Never mind whether it is difficult, or not: what is actually done?—The information always comes from the Health Department.

14,435. How do they get the information?—While daily going their rounds they hear something from the neighbours or the sweepers.

14,436. Do they visit all the houses?—They visit all the localities, not the houses themselves.

14,437. And they get what information they can from the neighbours?—Yes, and from private inquiries.

14,438. Is that generally satisfactory?—Yes, as a rule.

14,439. Do you think that disinfection itself is an adequate measure?—It adds to the efficacy of the plague operations. If it is entrusted to trained and experienced hands it does good. The disinfection should not be confined to plague-infected houses; it should be done all round.

14,440. If you had to advise on the appearance of plague in any village or town, would you be likely

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to advise that the sole measure should be disinfection? —No, the first measure should be evacuation and next disinfection.

14,441. You do not think that disinfection in itself could ever be adequate?—No.

14,442. You have figures showing the admissions into hospitals, and the races or castes of those admitted? —Yes.

14,443. And also the results—the deaths and recoveries?—Yes. The table is as follows:—

STATEMENT showing ADMISSION in the HOSPITALS, with RESULTS.*

Names of Hospitals.	Total Admissions.	Died within 24 Hours.			Remained at the Hospitals for more than 24 Hours.	Cured.			Died.			Percentage of Cure.		Remarks.
		Under Treatment.	Without Treatment.	Total.		Under Treatment.	Without Treatment.	Total.	Under Treatment.	Without Treatment.	Total.	In relation to Total Admission.	In relation to what remained after more than 24 Hours.	
Hindu -	174	29	26	49	125	60	8	68	42	15	57	39·08	54·4	
Muhammadan	48	4	6	10	38	15	5	20	9	9	18	41·66	52·63	
Pársee* -	13	2	—	2	11	6	—	6	5	—	5	46·15	54·54	*One was a Hindu.
Total -	235	35	26	61	174	81	13	94	56	24	80	40·0	54·02	

In all there were 235 admissions for all the hospitals. Of these the Hindu Hospital admitted 174, the Muhammadan 48, and the Parsees 13 only. Out of 235 admissions there is a total number of 141 deaths; of these 141 deaths, 60 died within 24 hours after their admission, whereas eighty (80) died subsequently. Of the 94 discharged cured, only 13 persons were not under hospital treatment. The percentage of cured to the total admissions is 40, and the percentage of cured to the number surviving 24 hours is 54. Many were moribund while they were brought, and that is why a large number of 61 died within 24 hours after admission. It will be seen that the percentage of recovery is much higher than what is usually found elsewhere. There was nothing particular as regards treatment, which consisted only of free stimulants, and Liq. hydrargyri perchloridi in large doses of dr. i to drs. ii, with diaphoretics, four to six times a day, with ice to the head, &c. The feeding and nursing were very efficient, and both of these factors have contributed largely towards this increased percentage of recovery. There was no lack of other medicinal comforts, and almost all the cases, except three of the pneumonic type, which all proved fatal, were usually of a very mild type. Hence it is that with the mild type of the disease, pneumonic and septicæmic varieties being markedly absent, good feeding and nursing and the stimulant line of treatment followed out at the hospitals, the higher percentage of recoveries is accounted for.

14,444. Could you tell us what religions or castes are chiefly affected?—Hindus chiefly.

14,445. Which caste was least affected?—The caste which was least affected of all in Ankleshwar was the Bhils.

14,446. Do you think there is any connection between the caste and the incidence of plague?—This much is certain, that it depends very much upon the way the people live, and also on the surroundings in which they live.

14,447. Therefore the castes which live in the poorest localities are most likely to suffer?—Yes.

14,448. You have figures showing the incidence of plague in each race and caste?—Yes. Turning to the total number of 331 attacks for Ankleshwar, and classifying them according to the population in each class, the following proportion is found:—

Classes.	Imperial Census Population.	Number of Plague Cases.	Number of Plague Attacks per 1,000.
Hindus - -	7,863	259	32·93
Parsees - -	313	12	38·01
Muhammadans -	2,501	60	24·0
Christians - -	15	—	—

Thus the highest percentage of attack is among the Parsees, contrary to the rule, when mostly elsewhere the Hindus head the list; the Hindus come next, and the Muhammadans last. The number of Parsee residents is small, but the percentage is high, as stated above, but the explanation is easy. It appears that a Parsee woman dying most probably of plague was ignorantly returned as of other cause on account of the nurse discovering no physical signs of plague. The body being also not disposed of in time to the Tower of Silence, infection appears to have spread to more persons; for, shortly after, the aunt, brother, and a cousin of the deceased fell victims to the plague, as well as two other Parsee women that were frequenting the house. The higher number of attacks, then, is thus accounted for. Now, of the total number of 331 cases registered in Ankleshwar, 259 cases were among the Hindus, 60 among the Muhammadans, and 12 among the Parsees. Among the Hindus, again, there were 68 cases in the Banniahs, 34 in the Brahmans, the Golas and the Ghanchis had 22 and 17 cases respectively, Kachias had 20, and the Khatris 15. Then 12 more cases in Bhils, 7 in Bhangis, 3 in Khalpas, and 5 in Talavias, and 56 miscellaneous make up the whole figure of 259 for the Hindus.

14,449. I believe you have figures showing the number of cases to 1,000 population in some of the principal sub-classes among the Hindus?—Yes. The following table still further illustrates the proportion of attacks to 1,000 population in some of the principal sub-classes among the Hindus. I need hardly say that the table differs considerably in different towns in showing the proportion, and is greatly influenced by the conditions of surroundings, mode of life, and the locality they stay in.

Classes.	Population according to Census.	Number of Plague Cases.	Proportion per Mille of Population.
Khatri - -	73	15	205·17
Golas - -	232	22	94·82
Bhangis - -	97	7	70·70
Brahmans - -	589	34	57·72
Banniahs - -	1,412	68	48·15
Ghanchis - -	548	17	31·02
Khalppas - -	99	3	30·30
Talavias - -	173	5	28·90
Kachias - -	721	20	27·73
Bhils - -	1,379	12	8·7

It will thus be seen that the Bhils escaped most on account of their stay on the outskirts of the town and open-air life they led, whereas the others suffered proportionately as they neared and lived in the infected localities or were away from it.

14,450. Are you likely to get sufficiently early warning of the occurrence of plague from merely studying the mortality tables of an area or of a city?—High mortality is always suspicious; and the inference to be drawn is that plague might be going on; but with a low mortality plague might be prevalent also.

14,451. Therefore it is not likely?—No. I have prepared a statement showing the daily death number since the plague in April with similar statements for the previous two years, and I find that increased mortality is not an absolute accompaniment of a plague epidemic in the beginning. But a low mortality for three months may prevail and the plague may also exist. Thus in May there were 24 deaths against 25 and 38 of the previous years. The month of June had an abnormally low number of 12 deaths. In July 1898, the mortality was about the average, but in August 1898 it was very great, there being 253 deaths against an average of 37; out of these, 139 were plague and 114 returned as of other causes, but it is probable that the excess might be due to plague as well. In September, 77 plague cases were recorded and 45 under other causes, which figure is about the average. In October the mortality had come down to 41, of which 10 were plague deaths only. The statement showing monthly mortality from April to November for the years 1896, 1897 and 1898 in Ankleshwar is as follows:—

Month.	Year.		
	1896.	1897.	1898.
April	63	35	30
May	38	25	24
June	31	28	12
July	86*	39	45†
August	43	32	253
September	41	32	122
October	31	38	41
November	32	32	49

* Includes 31 deaths from cholera.

† Includes 8 deaths from cholera.

14,452. You have expressed the opinion that evacuation is the most effective measure?—Yes.

14,453. Do you find that it is a measure which can be generally carried out without much difficulty or inconvenience?—There is always a certain amount of inconvenience; but it is a measure by which many lives can be saved, and the course of the disease greatly modified.

14,454. You mean to say that the inconvenience is not of very striking importance?—Considering the results that accrue it is not of striking importance.

14,455. I suppose the class of people you generally have to remove in the first instance is the poor people?—Yes.

14,456. Is evacuation likely to cause so much inconvenience and hardship to these people as to persons of a higher class?—No.

14,457. Why not?—Because these people are mostly farmers or cultivators, who can put up in the fields; but with the higher classes it would create great inconvenience, considering the mode of life they lead.

14,458. It is not so hard for the poorer people as it is for the rich?—No.

14,459. I believe you have some similar experience with regard to Bassein?—Yes.

14,460. When was plague introduced into this place? In 1896.

14,461. At what time?—The imported cases occurred in December 1896, and the indigenous cases occurred in February 1897.

14,462. Did you trace the origin of these cases?—They were imported from Bombay.

14,463. Did you get early information?—Yes.

14,464. What measure did you take when you got the information?—The people were removed to the hospital, the other members of the family were segregated, and the houses disinfected.

14,465. Was the surrounding area treated?—No, it was not.

14,466. What was the result; did other cases develop?—Yes.

14,467. The treatment was insufficient?—Yes.

14,468. Did you do anything more?—No, nothing.

14,469. How long did plague continue?—It continued for about six months.

14,470. Is that a long time?—No; it is the average time.

14,471. Supposing you had completely evacuated the place, would it have continued as long as that?—No, it would not have continued so long.

14,472. It was the average time when evacuation is not effected?—Yes.

14,473. Was the mortality high during the epidemic?—Not very. At Bassein there were two epidemics. The first epidemic was in 1897, and the second in 1898.

14,474. Is the 1898 epidemic still existing?—It is lingering.

14,475. In 1897, I understand you did not attempt complete evacuation?—No.

14,476. What was the population?—11,291.

14,477. What was the number of deaths?—There were 497 attacks and 377 deaths.

14,478. What was the treatment during the second epidemic?—The treatment differed at different periods. The original treatment of 1897 was continued, that is, segregating the healthy members, and the removal of patients to the hospitals. The treatment was confined to the house in which the case occurred. When, however, the disease went on increasing, the treatment was extended to blocks of houses, and in some cases whole streets were evacuated. After this there was a decline in the epidemic; but it again went up, and then the people tried to conceal more. The District Magistrate desired to prevent concealment, and in order to attain this end, it was resolved that the sick patient should be kept in his own house, that the other members of the family should be removed to the segregation camp, and the people in the adjoining houses requested to vacate. When this experiment was tried it was found that the disease fluctuated a little and then declined. These measures were adopted, however, in the month of March, when the disease was probably on the decline. Nothing, therefore, can be said about it with certainty. The same experiment was tried at Bhiwandi; but the results there were not so encouraging. The number of cases was large; and the total number of attacks in a population of 14,000 was 1,788.

14,479. Did you do anything further?—No. By that time the epidemic stopped of itself.

14,480. How long did it go on afterwards?—At Bhiwandi it continued for six months.

14,481. Therefore you are not in favour of home treatment?—No. Isolation is never strictly enforced.

14,482. You have a statement showing the number of attacks and deaths during seven months?—Yes, for Bhiwandi; it is as follows:—

Month.	Attacks.	Deaths.
April, 1898	23	17
May	69	47
June	93	67
July	545	353
August	877	619
September	173	139
October	8	13
Total	1,788	1,255

14,483. Have you anything which you would like to say with regard to the dissemination of the disease, other than what you have already told us?—I know of an instance in which a cat gave the disease.

14,484. Will you give us the details of that?—That cats do die of plague I have seen myself in the villages

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like Manori and Utan, which are fishing villages. To evidence the fact that a cat can give the disease, I would only instance a typical case that once came under my notice in the Satara District. While on travelling inspection duty at a station by name Masur, the station-master's daughter was seized with plague. The railway station was sufficiently far from the village, and on account of the plague being prevalent there, no one from the master's family was visiting the village: on inquiring into the cause of the illness, the station-master gave out that he had a pet cat, of which the girl was very fond. The cat looking ill, the station-master sent it away into the fields, but the girl being fondly attached to it, brought it back from the fields and played with her. The cat died the next day; the girl got fever the third day, which turned out to be bubonic plague and proved rapidly fatal.

14,485. Was that the third day after the death of the cat?—The second day after the cat died.

14,486. Did you make every inquiry with a view to showing that this girl could not have contracted the disease from any other source?—Yes. The girl did not visit the village where the plague was prevalent. That much is certain; and it is certain that there was no plague on the station premises.

14,487. This case occurred at the station-master's house; a good many people would be going there from many places which were infected?—Yes.

14,488. That is as far as you can go?—Yes.

14,489. Why do you say that the cat died of plague?—It was not medically examined; the blood was not bacteriologically examined.

14,490. What symptoms of plague had this cat? Why do you say it had plague at all?—The station-master found the cat very ill; that much is certain. He, being suspicious, sent it away into the fields. It was not medically examined, but, on the whole, as the girl was taken ill with plague soon after the cat was ill and dead, there is much ground for thinking that the cat died of plague.

14,491. But why should the cat die of plague?—The cat might have fed on dead or diseased rats and contracted plague.

14,492. You think that squirrels also may die of plague?—Yes.

14,493. On what grounds do you say that?—At Bhiwandi, where I was stationed on plague duty, I frequently changed quarters because wherever we went dead rats were being found, as well as squirrels.

14,494. Mostly dead of plague?—Yes. One squirrel had enlarged glands in the neck.

14,495. How many did you find?—I saw three in one house.

14,496. Did you see any in other houses?—I saw some dying at Ankleshwar.

14,497. About how many?—Only about four.

14,498. You have seen about seven altogether?—Yes.

14,499. On what grounds do you infer that these animals died or were ill of plague?—Because they all died at one place; and one squirrel had enlarged glands in the neck.

14,500. One only?—Yes.

14,501. Did you examine only one?—I only examined one, and it had enlarged glands.

14,502. But it was not bacteriologically examined?—No.

14,503. Do you know whether any monkeys have died of plague?—Yes, at Ankleshwar.

14,504. What did you see?—One had a bubo in the groin; it died near Ankleshwar Hospital, where there was a Plague Hospital.

14,505. How many monkeys did you see?—I saw only two.

14,506. There was no bacteriological examination?—No.

14,507. How do you suppose the squirrels became infected?—They became infected just as the rats became infected.

14,508. They do not go into the houses so much as the rats, do they?—They build their nests in the houses.

14,509. In the roof, or where?—They build their nests under the roofs and under the galleries.

14,510. Plague is generally found on the lower floors, is it not?—Yes.

14,511. And the squirrels do not reside on the lower floor. Supposing that plague is usually on the basement, how do you suppose that the squirrels became infected?—By frequenting the basement floors.

14,512. They are known to do that, are they?—Yes.

14,513. Do they feed on the basement floors?—Frequently.

14,514. How do you explain the fact of monkeys becoming infected?—They frequently visit the houses for the purposes of feeding; sometimes they steal food from the houses, and they catch plague in that way mostly.

14,515. Have you had experience of inoculation?—No, not much.

14,516. Have you inoculated any persons yourself?—About 40.

14,517. Have you watched these cases for more than one day?—Yes.

14,518. Have you seen any bad results in any of them?—I do not know of any bad results in any of them.

14,519. Not even much local inconvenience at the place of inoculation?—They complain of pain in the arm and sometimes severe headache; but I have seen no abscesses, or any neuralgic pains or any wasting of the arm.

14,520. Has the temperature ever been very high?—Not beyond 104.

14,521. (*Dr. Ruffer.*) How long did the plague last at Bhiwandi?—Six months.

14,522. It was not vacated?—No. Efforts were made to evacuate the place, but the people would not comply with it.

14,523. How long did the plague last at Ghanchiwad, Mulawad, and Khatkiwad?—It ceased soon after evacuation.

14,524. I asked how long it lasted from beginning to end?—It is still going on at Broach.

14,525. That has been evacuated?—The locality of Khatkiwad has been evacuated, the whole of Broach was not evacuated.

14,526. And it is still going on?—Yes, as only part of the town has been evacuated.

14,527. How long has it been going on in these places which have been totally evacuated?—Not longer than a month.

14,528. That is not what I asked you; you say Ghanchiwad, Mulawada, and Khatkiwad were completely evacuated by the end of July; how long did plague last in those three villages from beginning to end?—Ghanchiwad, Khatkiwad, and Moolawad, mentioned in my précis of evidence, are streets of Ankleshwar town, and plague there lasted only about a fortnight.

14,529. How long had it been going on before?—Plague increased in intensity at Ankleshwar in the latter part of July, and it was evacuated by the end of July in the hope of saving the rest of Ankleshwar.

14,530. I thought it began in April?—Yes, but then it was quiet.

14,531. When did the plague begin at Ghanchiwad?—In April.

14,532. When did it stop?—At the end of July.

14,533. At Ankleshwar there was plague from the beginning to the middle of April?—At the beginning it was only at Ghanchiwad, not at Mulawad. They are parts of the same town.

14,534. Therefore plague had been in that town at the beginning of April?—Yes.

14,535. You had cases among the people living in the town or in the fields until the 17th September, had you not?—Yes. After the evacuation of the whole village cases were occurring among the people in the fields too.

14,536. They are the people who were living in Ankleshwar?—Yes.

14,537. Therefore, the epidemic lasted six months in the same way as it lasted six months in the other place; where does the benefit of evacuation come in? Was not the duration the same at Ankleshwar which was evacuated and at Bhiwandi, which was not evacuated?—It was six months at both places, but it would, perhaps, have been longer than six months at Ankleshwar if there was no complete evacuation.

14,538. Of the 10,692 people whom you evacuated, how many remained after evacuation and how many ran away to other villages? You say that 11 or 12 cases occurred in a population of 10,692, according to the Imperial census of 1891, but that the population was decreased by flight and emigration to 4,428?—Yes.

14,539. Therefore, nearly 6,000 people left the town?—Yes.

14,540. That is, more than two-thirds of the people disappeared?—Yes.

14,541. What became of those people?—Some went into the neighbouring villages and others to other towns such as Bombay, Surat, and Ahmedabad.

14,542. Did not they carry the plague with them?—No reports have come from other districts.

14,543. Do you think it is likely that they carried the plague with them?—It is likely.

14,544. Where is the benefit of evacuation if 6,000 people left the town for other villages?—None left without being in the health camps for 10 days, so that it is likely that they did not carry plague.

14,545. Why do you use the word "fly" in your précis of evidence?—That is a mistake.

14,546. How many people were there in the health camps?—I do not know the exact number, but there were many; nobody could leave without being in quarantine for 10 days.

14,547. Anyhow, over 6,000 people left the town and disappeared?—Not 6,000.

14,548. 4,428 from 10,692 leaves 6,200?—Some must have fled.

14,549. You do not know the mortality of the people who fled; how then can you compare the mortality of this town, when more than two-thirds of the inhabitants had fled, with the mortality at Bhiwandi?—Bhiwandi was thinned down to 7,000, cut of a population of 14,000, and hence approximate comparison can be made.

14,550. What became of the 6,000 people who fled; do you think they are likely to have carried the plague into neighbouring villages?—Yes.

14,551. (*The President.*) Why do you think so?—Because the plague broke out in the villages afterwards.

14,552. What town is this you are talking of?—Ankleshwar.

14,553. At first you did not attempt to have complete evacuation?—Not at first.

14,554. Before you adopted the measures which you recommend as being effective, the people became frightened and ran away?—I cannot state at what period they ran away; they might have run away before or afterwards.

14,555. After complete evacuation?—No, before that.

14,556. The measure of evacuation was delayed, and in that period of delay an opportunity was given to the people to spread the disease by running away; if you had adopted complete evacuation at the very commencement of the epidemic in this town, could these people have run away to these different places?—They might.

14,557. Had you no cordon?—No.

14,558. Had you any roll-call in the camps?—Yes, there was a roll-call.

14,559. Had you no means of preventing them running away from the camps at any time?—They could not run away from the camps. They could not do so without being in quarantine for ten days.

14,560. (*Dr. Ruffer.*) You told me you could not state the number of people in the health camps?—If they went to the villages, the Patels of the taluka villages had orders not to admit an outsider without keeping him under observation for 10 days again.

14,561. (*The President.*) If you had carried out complete evacuation at the commencement, the people evacuated would have been under control and inspection, would they not?—Yes.

14,562. They would not have been allowed to leave the camp until they had been there for 10 days?—No, they would not have been allowed.

14,563. Therefore it is not at all probable that, after leaving, many of them could have spread the infection into the neighbouring villages?—That is so.

14,564. If they spread the disease in this case which has been referred to, it is because the measure which you think efficient had not been properly adopted?—Yes.

14,565. (*Dr. Ruffer.*) Why do you think the people ran away?—Simply from fear of the disease.

14,566. Did they run away from fear of the measures also?—They might have.

14,567. When did the people begin to run away? Did they begin when you adopted the segregation measures or before?—From the very beginning of April they began to run away.

14,568. In what months did the majority of them disappear?—I have no knowledge of that; they began to run away from the very beginning.

14,569. (*The President.*) Have you any knowledge of people going back to a village after an epidemic had apparently ceased?—Yes.

14,570. In any such village, have you any knowledge of further cases occurring after the people went back?—No.

14,571. (*Mr. Cumine.*) You have spoken of rats migrating from the village of Utan to another village at a distance of five miles. Did anybody see the rats going?—I do not know that.

14,572. With regard to the Postmaster's daughter who caught the plague, please say whether, although the general public might only be admitted to the verandah and transact business through the window, the postal clerks and deliverers would not come actually inside the house?—The office is separate from the house. They would go into the office only.

14,573. Is the office room in the same building as the house?—Yes.

14,574. The postal clerks and deliverers would go inside the office room, would they not?—Yes.

14,575. With regard to the clothing in Ankleshwar, which you speak of as having been carried, were the streets which these clothes are said to have infected adjoining the houses where plague was?—Yes.

14,576. Would you not naturally expect those streets to become infected at an early date, independently of any clothing having been carried? Would you not expect them to be infected for the very reason that they were streets that adjoined an infected place?—That might be so.

14,577. How did the clothes get from the first infected house to the houses which they are supposed to have infected? Were they not carried by human beings?—Yes.

14,578. Can you say, then, with confidence that it was the clothes which carried the infection, not the human beings?—I cannot say; but there is a great probability of the clothes giving plague, as they belonged to the infected house, and not the persons who carried as they stayed very little at the places.

14,579. (*The President.*) I should like to get your facts with regard to several villages in which you have carried out, in the first place, partial evacuation at the commencement, and, in the next place, total evacuation at the commencement. Have you any facts as to the number of plague cases in these several villages before and after complete evacuation?—I have not them with me.

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14,580. Can you get us this information?—Yes. (The witness with refereuce to villages under his charge in the Ankleshwar Taluka, viz.) :— following statement was afterwards submitted by the

Serial No.	Name of Villages.	Population.	Date of First Case.	Date of Last Case.	Number of Plague Cases.	Number of Plague Deaths.	Date of Evacuation.	Duration of the Epidemic.
1	Avádar	391	11·9·98	9·10·98	4	3	12·9·98	28 days.
2	Umarwada	1,044	12·9·98	9·10·98	12	8	16·9·98	27 „
3	Divi	649	30·9·98	10·10·98	4	1	1·10·98	10 „
4	Bhadkodra	419	5·10·98	13·10·98	11	8	6·10·98	8 „
5	Piráman	369	17·10·98	21·10·98	2	1	18·10·98	4 „
6	Diwá	3,362	18·10–98	7·12·98	24	16	21·10·98	50 „
7	Sámore	542	20·10·98	13·11·98	8	2	21·10·98	24 „
8	Kosumbdi	1,201	22·10·98	22·10·98	1	0	22·10·98	—
9	Chhápra	375	25·10·98	21·11·98	7	3	25·10·98	27 days.
10	Nágal	476	29·10·98	27·11·98	7	6	1·11·98	29 „
11	Ámboli	396	4·11·98	16·11·98	6	4	7·11·98	12 „
12	Pungáum	585	8·11·98	8·11·98	1	1	8·11·98 Partial	—
13	Mándvá-Buzurg	2,005	19·11·98	29·12·98	6	4	20·11·98	40 days.
14	Boidrá	509	1·12·98	8·12·98	3	3	Partial 5·12·98 Complete 5·12·98	7 „

At Kosumbdi and Pungáum there have been no more cases after evacuation. At Piráman, Boidra, Bhadkodrá, Divi, and Ámboli, plague disappeared after an interval of 4, 7, 8, 10, and 12 days respectively. Out of the remaining seven villages, at Samore, Umarwada, Chhápra, Avádar, and Nagal, it disappeared within a month, and after an interval of 24, 27, 27, 28, and 29 days respectively. Only at Mándvá-Buzurg and Diwa has the disease taken longer than a month, viz., 40 and 50 days respectively. At Diwa the disease has lingered because of the people concealing cases and evading the plague authorities, as mentioned in my précis of evidence. Everywhere complete evacuation was carried out on the first appearance of plague cases, as early as possible; except at Mándvá-Buzurg, where in order that the people might not be more inconvenienced than was absolutely necessary, and also on account of its large population, and the few scattered cases that were occurring, partial evacuation was carried out. But as a plague case was detected on 3rd December 1898 in the remaining half of the village, that was not evacuated, the whole of the village was completely evacuated on the 5th December 1898. This explains why the plague died out at the end of 40 days. At Pungáum, the block of houses occupied by the Talavias, among whom the case was discovered, was completely a detached one from the rest of the village, and hence the evacuation of the block only has succeeded in stamping out plague.

(Witness withdrew.)

Dewan Bahadur V. M. Samarth.

DEWAN BAHADUR V. M. SAMARTH called and examined.

14,581. (*The President.*) You are the Subah of the Naosari Division?—At present, but until very recently, that is, until the commencement of January, I was Subah of the Baroda Division.

14,582. (*Mr. Cumine.*) Will you tell us the population of Baroda town?—112,471.

14,583. There have been two epidemics in Baroda town, have there not?—I call them two epidemics, but some people do not.

14,584. When did the first indigenous cases occur?—In April 1897.

14,585. How many cases were there?—Seven.

14,586. In what parts of the town?—Four in Barhanpura, two in Dandia Bazar, and one again in Barhanpura.

14,587. I suppose you adopted the usual measures of isolating the sick and segregating the contacts?—Yes.

14,588. And disinfecting the infected houses?—Yes.

14,589. Did you disinfect them with perchloride of mercury?—Perchloride of mercury came at a later stage.

14,590. I mean in the first epidemic?—We confined ourselves to limewash.

14,591. Then the first epidemic apparently died out?—Yes.

14,592. Between the two epidemics had you any corpse inspection?—There was a kind of house-to-house visitation, but not a very strict or rigid one.

14,593. Was there any corpse inspection?—I am not aware of it.

14,594. Have you a record of the deaths which occurred from all causes in the period between the two epidemics?—I could compile them.

14,595. Could you mark with serial numbers, on a map of the town, the streets (and if possible the houses) where all the deaths occurred, that occurred in one of the central months of the interval—say July or August—in the parts of the town called Barhanpura and Dandia? The object is to see whether the cases that occurred in those quarters between the two epidemics were occurring several in one house, or at any rate in clusters of houses?—No; I am afraid it would not be possible to prepare such a map at this date with accuracy. I have not got the requisite details.

14,596. In what month did the second epidemic begin?—In October.

14,597. In what part of the town?—In Barhanpura.

14,598. During the rains plague had been bad at Cutch Mandvi, Palanpur, Surat and other places?—Yes.

14,599. Did many people come in from those infected places?—Yes, from Surat especially.

14,600. When this second epidemic began, did you start a house-to-house inspection?—Yes.

14,601. What was the result of that? Had it a good result, or did it lead to concealment?—I do not believe they could detect cases. Of course it depended upon the individual influence of the people on the Committee; but, as a rule, I think the Committees did not serve the objects for which they were appointed very satisfactorily.

14,602. Are these Committees you speak of Committees which worked in the interval between the two epidemics or after the beginning of the second epidemic?—Both; they were working off and on.

14,603. Did these search parties result in sick people being carried about from one house to another to escape detection?—That was in October.

14,604. In the second epidemic did you adopt the ordinary measures of isolation of the sick and segregation of the contacts?—Yes.

14,605. Did plague nevertheless spread?—Yes.

14,606. Did you then adopt a system of evacuating whole streets?—Yes.

14,607. In spite of that, did plague spread?—Yes.

14,608. How did plague appear to spread from house to house within the town? Was it by people who had come to visit sick friends, or did it spread to houses immediately behind or next door the infected houses, or how?—People at a long distance from one another were found to be affected, and the reason often traced was that they had paid visits to one another, or that an actual plague case was removed clandestinely and put into another house.

14,609. When patients were taken to the hospital did you allow the families of the patient to go with them?—One or two persons to attend on them.

14,610. Did you disinfect the infected houses?—Yes.

14,611. With what?—First only with limewash, but later on perchloride of mercury was recommended to us.

14,612. When did you begin using the perchloride of mercury?—Some time in the middle of November.

14,613. The evacuation by streets having failed to stop the spread in the town, did you then proceed to evacuate the whole town?—That was after a long time, when plague had increased very much and there was no other method of dealing with it.

14,614. By what date was the whole town evacuated?—In March 1898.

14,615. The great mass of the people, I understand, lived in two kinds of camps; there was one kind consisting of free camps erected by Government?—By or under the supervision of Government, which we called authorised camps.

14,616. The second class was the unauthorised camps consisting of people who had apparently gone out and put up their own huts in the outskirts?—Yes, wherever they liked. They had fled away and they were not exactly under our supervision or control.

14,617. With regard to the people in the authorised camps, had you any roll-call for them?—Yes.

14,618. Were they allowed to go about their ordinary duties during the day?—Yes.

14,619. What did you do to prevent their sleeping in the town by night?—At the camps in the evenings till 9 o'clock their presence or absence was noted by clerks. I have given a description of the camp in a supplementary paper added to the précis of my evidence. There I state that the big camp was divided into four sections, and over each section there was a clerk appointed who had a pass-book. The passes were of two kinds, permanent and temporary, Those people who wanted to go to the city were given a permanent pass which they could show once in the evening to the clerk who would note the man's presence. Those who had only a temporary pass for the day returned the pass, and whenever it was found the pass was not noted or returned the Superintendents of the wards in the town were communicated with and they went about looking for the man. Men were sometimes found out and sent back.

14,620. How many people, approximately, did you have in the authorised camp?—Over 11,000 persons. There was a regular organisation set up. Each camp had a Superintendent first of all, and under him was a supervisor and some clerical establishment. Then each camp was laid out in streets, and a sufficient number of people and huts were set apart for each Karkun (clerk). Each Karkun had a roll-call and the huts were numbered, and also the persons in each were entered by name and age. The Karkun would go round to each hut once in the morning and once in the evening to see that each of the inmates was there, or if they had gone away whether they had been furnished with a pass or not.

14,621. When cases of plague were detected in the authorised camps, did you remove the plague-stricken persons to hospital?—Yes.

14,622. Did you lever try isolating them in the camp itself?—We had two or three huts set apart, one for observation, one for hospital, and one for contacts, but, as a matter of fact, there were very few cases which we had to deal with there.

14,623. When a case did occur, did you find it spread much to other people in those camps?—No.

14,624. When a case did occur, whence did the infection in most cases seem to have been brought?—It seemed to have been brought by the persons themselves from the town. Most of the cases which came to my knowledge occurred within a week of the person's arrival. I had only nine cases among those 11,000 persons, seven of which were fatal and two recovered.

14,625. Before you admitted these 11,000 people into your authorised camps did you disinfect all their clothing and effects?—Yes. The method adopted was this. I would take them out of their houses, and send them to a big segregation house, and keep them there for a day, during which their persons and clothes were disinfected, and also their bedding. Whatever they were going to carry into camp was disinfected, and then they were removed direct to the camp.

14,626. Did you find that the people in the camps used, in their own self-defence, to isolate their sick neighbours?—There was no opportunity for that, because as soon as a case occurred it was detected.

14,627. With regard to the unauthorised camps, what control did the Government exercise over the people in them?—At the commencement practically there was no control. We did not know how many had fled away or where they had fled; but afterwards I appointed a Superintendent with four or five clerks and servants to go round the city and note how many had gone, from which quarter of the town, and also make out a census of them. Every three or four days, or at least twice a week, a Superintendent was able to go and note whether all the persons were there. There was no pass-system for them; there was no establishment or organisation set up for them, and so they used to go to the city, and perhaps live in the city, and go away whenever they liked. People who became sick in the camps were brought surreptitiously and left in the houses, which were locked sometimes, while the others went away. But less of that sort of thing happened after the Superintendent commenced to go about regularly.

14,628. When did the epidemic cease?—April 1898.

14,629. About what date were the people allowed to return into their houses in the town?—Towards the middle of May, or the commencement of June, the town was nearly full.

14,630. Did any recrudescence occur?—None after they returned.

14,631. In the meantime had every house in the town been disinfected, whether a plague case had occurred in it or not?—No. We knew certain houses where plague cases had occurred. I adopted a system of marking the houses. Wherever a plague case had occurred I put a circle on the house; wherever there was a suspected case I put a semi-circle; where a case was removed from one house to another surreptitiously I put a triangle; and where only a death of an ordinary kind was reported I put a square. Those marks enabled me to know by sight which houses were really infected. At first I told my subordinates to disinfect only the houses where a circle and semi-circle had been put up, but after the town was completely evacuated it struck me that in the earlier stages, at any rate, of our operations many plague deaths passed off undetected for ordinary deaths, so that merely disinfecting houses declared to be infected with plague was not a safe measure, and so I ordered that any house wherein any plague cases had happened, or any death had taken place; that is, the houses with all those marks were to be disinfected. The rest of the houses were not disinfected with perchloride of mercury; they were thoroughly cleaned, the tiles taken off, and holes bored to let in light and ventilation, and they were also limewashed from top to bottom. That was all that I did.

14,632. Can you tell me what you had done with the shopkeepers and the shops in the town? Had you allowed them to take their goods out with them to the camps, and set up booths there, as is done in the large fairs in India?—No. I said I should have no objection if they set up shops in the camps, but very few did actually take their shops with them to the camps. I allowed people to go to their shops for ordinary avocations after I had seen the place was disinfected or whitewashed, as the case might be. The big bazar, for instance, you would always find full, that is, comparatively speaking; it would not be as full as it is to-day, but you would find people there doing business. I took care that those shops were previously limewashed or disinfected if there had been a death there.

14,633. Were those shopkeepers allowed to sleep in their shops?—No, except later on, when they complained that there might be cases of fire or theft, and when plague had really disappeared.

Dewan Bahadur V. M. Samarth.

3 Feb 1899.

14,634. Did you notice any decrease in the strength of the poison as the epidemic drew towards a close? Did more people seem to survive the attacks?—That is my impression.

14,635. Are there any measures which you adopted of the utility of which the people are so convinced that they would adopt them themselves if plague came back again?—I should think a considerable portion of the people now are convinced that evacuation is a very good measure for them.

14,636. Do they realise the danger of returning and sleeping in their houses in the infected site?—I think so, though there may be other considerations which weigh with them, such as fatalism, which makes them say they must look after their property, but their lives may take care of themselves.

14,637. Will you give us the weekly figures of the attacks and deaths, and also the total attacks and deaths by races and ages?—Yes, they are as follows:—

A.

STATEMENT showing GENERAL MORTALITY in the CITY OF BARODA during the Week ending 9th October 1897 to 1st January 1899.

No.	Week ending	Total Number of Deaths.				Castes.		Ages.				Remarks.
		Plague.	Fever.	Other.	Total.	Hindus.	Muhammedans.	Below 12.	Below 40.	Above 40.	Total.	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1	9th October 1897	1	35	74	110	98	12	25	65	20	116	
2	16th „ „	2	34	68	104	94	10	20	61	23	104	
3	23rd „ „	1	30	81	112	96	16	22	60	30	112	
4	30th „ „	1	16	93	110	97	13	21	63	26	110	
5	6th November „	—	47	91	138	129	9	17	75	46	138	
6	13th „ „	1	24	71	96	88	8	15	55	26	96	
7	20th „ „	10	36	92	138	120	18	40	76	22	138	
8	27th „ „	3	38	108	149	110	39	35	86	28	149	
9	4th December „	3	37	106	146	129	17	36	90	20	146	
10	11th „ „	6	39	104	149	130	19	38	93	18	149	
11	18th „ „	13	48	133	194	183	11	51	104	39	194	
12	25th „ „	27	48	140	215	184	31	41	126	48	215	
13	2nd January 1898	39	36	113	188	155	33	32	85	71	188	
14	9th „ „	40	60	135	235	218	17	45	122	68	218	
15	16th „ „	61	81	154	296	240	56	73	170	53	296	
16	22nd „ „	66	80	152	298	252	46	77	183	38	298	
17	29th „ „	70	87	189	346	297	49	56	224	66	346	
18	5th February „	115	77	144	336	292	44	55	224	57	336	
19	12th „ „	96	38	175	309	266	43	62	120	127	309	
20	19th „ „	128	31	155	314	271	43	62	143	109	314	
21	26th „ „	166	44	159	369	317	52	67	152	150	369	
22	5th March „	141	19	108	268	218	50	48	111	109	268	
23	12th „ „	81	4	74	159	121	38	25	80	54	159	
24	19th „ „	64	5	61	130	104	26	19	59	52	130	
25	26th „ „	42	3	63	108	80	28	26	51	31	108	
26	2nd April „	39	3	53	95	80	15	20	37	38	95	
27	9th „ „	21	5	58	84	70	14	21	25	38	84	
28	16th „ „	5	1	40	46	37	9	12	24	10	46	
29	23rd „ „	2	2	61	65	54	11	16	31	18	65	
30	30th „ „	1	—	51	52	46	6	18	20	8	46	
31	7th May „	—	3	42	46	40	6	17	14	15	46	
32	14th „ „	—	4	24	28	24	4	12	9	7	28	
33	21st „ „	—	2	31	33	28	5	13	9	11	33	
34	28th „ „	1	1	55	57	43	14	22	23	12	57	
35	5th June „	—	2	49	52	47	5	26	10	16	52	
36	12th „ „	—	2	55	57	47	10	25	19	13	57	
37	19th „ „	—	1	37	38	32	6	12	9	17	38	
38	26th „ „	—	4	35	39	32	7	16	13	10	39	
39	2nd July „	—	1	36	37	29	8	16	8	13	37	
40	9th „ „	—	2	45	47	40	7	26	10	11	47	
41	16th „ „	—	3	58	61	53	8	35	12	14	61	
42	23rd „ „	—	3	64	67	59	8	34	13	20	67	
43	30th „ „	—	3	57	60	51	9	37	11	12	60	
44	7th August „	1	1	68	70	57	13	32	14	24	70	
45	14th „ „	—	5	64	69	69	9	42	14	13	69	
46	21st „ „	2	2	78	82	60	22	40	18	24	82	
47	28th „ „	0	2	55	57	45	12	28	15	14	57	
48	4th September „	—	2	53	55	49	6	26	13	64	55	
49	11th „ „	1	4	72	77	64	13	44	19	14	77	
50	18th „ „	—	3	47	50	42	8	27	11	12	50	
51	25th „ „	—	9	57	66	54	12	31	16	19	66	
52	2nd October „	—	8	69	77	64	13	33	21	23	77	
53	9th „ „	3	10	58	71	54	17	31	22	18	71	
54	16th „ „	4	3	66	73	65	8	35	19	19	73	
55	23rd „ „	4	6	65	75	65	10	35	20	20	75	
56	30th „ „	2	9	78	89	67	22	36	26	27	89	
57	6th November „	—	14	68	82	67	15	38	22	22	82	
58	13th „ „	3	9	59	71	62	9	30	21	20	71	
59	20th „ „	2	3	80	85	69	16	39	25	21	85	
60	27th „ „	4	5	86	95	81	14	39	28	28	95	
61	4th December „	2	5	77	84	70	14	34	19	31	84	
62	11th „ „	3	15	64	82	68	14	34	29	29	82	
63	18th „ „	7	7	84	98	80	18	36	37	25	98	
64	25th „ „	6	12	71	89	75	14	38	28	23	89	
65	1st January 1899	14	18	100	132	114	18	48	51	33	132	
		1,304	1,187	4,939	7,730*	6,543	1,187	2,152	3,463	2,115	7,730	

* 7,381, exclusive of the figures from October 1897 to January 1898.

STATEMENT showing the NUMBER of PLAGUE CASES in BARODA CITY during the Weeks ending 9th October 1897 to 1st January 1899.

No.	Week ending	Total Plague Cases.	Castes.		Ages.				Sources of Information.						Remarks.
			Hindus.	Muhammadans.	Below 12.	Below 40.	Above 40.	Total.	By Search Party.	By People.	By Police.	Detectives.	Anonymous Letters.	Total.	
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1	9th October 1897	1	1	—	—	1	—	1	—	—	—	—	—	—	Not available.
2	16th „ „	2	2	—	—	2	—	2	—	—	—	—	—	—	
3	23rd „ „	1	1	—	—	1	—	1	—	—	—	—	—	—	
4	30th „ „	1	1	—	—	1	—	1	—	—	—	—	—	—	
5	6th November „	—	—	—	—	—	—	—	—	—	—	—	—	—	
6	13th „ „	1	1	—	—	—	1	1	—	—	—	—	—	—	
7	20th „ „	10	8	2	1	6	3	10	—	—	—	—	—	—	
8	27th „ „	3	2	1	—	2	1	3	—	—	—	—	—	—	
9	4th December „	9	7	2	3	4	2	9	—	—	—	—	—	—	
10	11th „ „	9	8	1	2	6	1	9	—	—	—	—	—	—	
11	18th „ „	20	17	3	4	13	3	20	—	—	—	—	—	—	
12	25th „ „	42	37	5	8	25	9	42	—	—	—	—	—	—	
13	2nd January 1898	52	44	8	12	32	8	52	—	—	—	—	—	—	
14	9th „ „	49	46	3	8	32	9	49	7	9	27	3	3	49	
15	16th „ „	69	62	7	8	46	15	69	20	6	40	—	3	69	
16	23rd „ „	75	66	9	6	62	7	75	29	11	35	—	—	75	
17	30th „ „	110	106	4	20	77	13	110	48	14	48	—	—	110	
18	5th February „	136	127	9	22	79	35	136	76	18	41	1	—	136	
19	12th „ „	118	107	11	20	68	30	118	99	4	15	—	—	118	
20	19th „ „	154	135	19	16	90	48	154	98	13	41	2	—	154	
21	26th „ „	195	171	24	35	106	54	195	170	7	18	—	—	195	
22	5th March „	162	143	19	22	96	44	162	153	2	7	—	—	162	
23	12th „ „	90	69	21	12	54	24	90	68	6	16	—	—	90	
24	19th „ „	67	58	9	8	38	21	67	24	2	41	—	—	67	
25	26th „ „	66	59	7	8	46	12	66	64	2	—	—	—	66	
26	2nd April „	39	31	8	5	26	8	39	31	6	2	—	—	39	
27	9th „ „	17	13	4	1	11	5	17	16	1	—	—	—	17	
28	16th „ „	3	3	—	—	2	1	3	3	—	—	—	—	3	
29	23rd „ „	4	4	—	1	2	1	4	4	—	—	—	—	4	
30	30th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
31	7th May „	—	—	—	—	—	—	—	—	—	—	—	—	—	
32	14th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
33	21st „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
34	28th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
35	4th June „	—	—	—	—	—	—	—	—	—	—	—	—	—	
36	11th „ „	1	1	—	1	—	—	1	1	—	—	—	—	1	
37	18th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
38	25th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
39	2nd July „	—	—	—	—	—	—	—	—	—	—	—	—	—	
40	9th „ „	1	1	—	—	1	—	1	1	—	—	—	—	1	
41	16th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
42	23rd „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
43	30th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
44	6th August „	1	1	—	1	—	—	1	1	—	—	—	—	1	
45	13th „ „	2	1	1	1	1	—	2	2	—	—	—	—	2	
46	20th „ „	2	2	—	—	2	—	2	2	—	—	—	—	2	
47	27th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
48	3rd September „	—	—	—	—	—	—	—	—	—	—	—	—	—	
49	10th „ „	0	—	—	—	—	—	—	—	—	—	—	—	—	
50	17th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
51	24th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
52	1st October „	—	—	—	—	—	—	—	—	—	—	—	—	—	
53	8th „ „	8	8	—	3	7	1	8	8	—	—	—	—	8	
54	15th „ „	—	—	—	—	—	—	—	—	—	—	—	—	—	
55	22nd „ „	5	5	—	—	4	1	5	5	—	—	—	—	5	
56	29th „ „	1	1	—	—	1	—	1	1	—	—	—	—	1	
57	6th November „	2	2	—	—	2	—	2	2	—	—	—	—	2	
58	13th „ „	4	4	—	—	3	1	4	4	—	—	—	—	4	
59	20th „ „	2	2	—	—	2	—	2	2	—	—	—	—	2	
60	27th „ „	5	4	1	1	4	—	5	5	—	—	—	—	5	
61	4th December „	7	6	1	—	7	—	7	7	—	—	—	—	7	
62	11th „ „	3	3	—	—	3	—	3	3	—	—	—	—	3	
63	18th „ „	10	9	1	1	8	1	10	10	—	—	—	—	10	
64	25th „ „	7	7	1	—	6	1	7	7	—	—	—	—	10	
65	1st January 1899	16	13	3	2	13	1	16	16	—	—	—	—	16	
		1,582	1,398	184	229	992	361	1,582	987	101	331	6	6	1,431	
	Went of their own accord to the hospital.	71	—	—	—	—	—	—	—	—	—	—	—	151	Information not available.
			—	—	—	—	—	—	—	—	—	—	—	1,582	

14,638. I should also like to know the admissions and attacks in the segregation camps showing how long after admission plague developed in each case, in order to find the period of incubation?—This latter information I cannot give.

14,639. Could you tell us the number of attendants who were attacked in the plague hospital?—No, I could not.

14,640. Have you any note of the number of relatives who were attacked while attending on their sick friends

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in hospital?—I have not. I left all that to the medical men.

14,641. Have you noticed cases where monkeys, squirrels, or cats have got plague?—I have heard and got reports of monkeys, but I have not personally seen them. A couple of months ago I saw a dead squirrel with glandular swellings, and I also noticed a dead cat with glandular swellings just below the jaw.

14,642. Has it been noticed that fleas have increased very much in numbers when plague appeared in a house?—I could not say that with regard to Baroda, because Baroda has been generally noted for its colony of fleas.

14,643. How many villages have been infected?—39.

14,644. How was the infection carried to them? Generally speaking, by human agency?—Whether it was by human agency or by rats could not be demonstrated positively. The first village infected was Undhera. The first case was traced to Baroda; it was the case of a woman who had come here to see her mother who was plague-stricken. She passed the night with her mother, and then went away to the village, and she was the first person to be attacked, and who died. It might have been her clothes, or it might have been her person.

14,645. Have rats ever been seen going from one village to another?—No.

14,646. When plague was discovered in a village I suppose you started a Plague Hospital and a segregation camp, as at Baroda?—Yes. It was more convenient to tell the people of the villages to go to their fields in convenient blocks, to certain wells, or under a certain clump of trees, and have supervision over them. Sometimes I gave them the option of each group going to its own field. At Baroda I had actually a spot set apart where alone they could go.

14,647. Have you any case where partial evacuation of a village was sufficient to stop the plague?—No, I think we evacuated every village entirely where there was an indigenous case.

14,648. Is there any case where a partial evacuation was tried?—Yes. Undhera; partial evacuation was tried there and failed.

14,649. In all cases you had total evacuations?—As a rule, and we got that rule from the Government.

14,650. Did you allow people to set up their huts where they liked?—Yes, outside in the fields.

14,651. What did you do to prevent their returning to their houses in the infected site?—I had a complete organisation to supervise village plague measures. Each village had a Patel and an accountant, but in Gujarat each village besides the Patel has sub-Patels, Matadars, who are hereditary officers. I had a census of the village taken, whether the village was infected or uninfected. The villages were divided into as many wards as there were Matadars, or even fewer. Then the Matadars would go round to a certain number of houses set apart for them, and report all cases of sickness to the police Patel, who was the head, and he would note them all down in the register. Whether this system worked or not is a question. For four or five villages I had one supervising clerk appointed. Twice or thrice in the week he would go round to each of these villages, making a surprise visit, and seeing whether the work was properly done or not. Where a village was actually infected I used to put one or two police to see that nobody entered the village except with the authority of the police Patel.

14,652. How were plague cases detected amongst evacuated people?—The Matadars, after the villagers had left the village, would divide a certain part of the fields among themselves, and go round every morning. There was a fresh census taken after the village had been evacuated, and there was an allotment of work among the Matadars. Whether the people were inside or outside the village, there was the same sort of inspection.

14,653. Were these evacuated people allowed to go by day about their ordinary employments?—Yes, except when they were actual contacts. Actual contacts were set apart by themselves.

14,654. Did you disinfect their clothing and effects at the time you evacuated them?—As a rule. In some cases it may not have happened. It may have been done afterwards, but it was the rule to do it at the time.

14,655. Will you put in a table showing the name of each village, its population, the total cases before the evacuation, the date of evacuation, and the daily attacks during each of the 10 days after evacuation, and the total number of attacks after the 10th day until the epidemic ceased, and the date of the last case?—Yes.*

14,656. After the people had been evacuated did you disinfect all the houses in the village, or only those in which you thought there was infection?—Only in those in which we suspected the infection lay,—that was by actually finding cases there.

14,657. What disinfectant did you use?—The same as in the town, perchloride of mercury and perchloride of lime.

14,658. Was there any case of recrudescence of plague after the people had been readmitted into their houses?—No, except Savali. Savali was a village which did not get a fair chance of living outside in camps for a long time, and for a long time the cases were concealed. When it came to our knowlege that the general mortality had risen very high, I sent Mr. Ambegaonkar, and he found that there were cases. We then took them out. I think I took them out, not merely by persuasion, but where it failed, by gentle threats. They went out, but before they went out there was a riot, and I had to go and suppress the riot, which took some time. Mr. Ambegaonkar was very nearly sent to his Fathers. By the time they were taken out, it was nearly the middle of May, and on the 5th June we had rain, so that they were scarcely three weeks out. The village did not really get a chance of becoming disinfected thoroughly, nor had they the chance of shaking off the infection in them. When the rains came the people were admitted into the village, and about a fortnight after their admission cases appeared, and there was a fearful recrudescence in Savali. With the exception of that village, I am not aware of any where we had taken out the people and disinfected the village where there was a recrudescence after they returned.

14,659. When a plague case occurred among the evacuated people, did you find it spread much to the other people or not?—There were cases after they were evacuated, but the epidemic was not being communicated very rapidly.

14,660. I mean amongst the evacuated people in the camps. When one of those people got plague, did other people get it from him?—Sometimes the friends and relatives did get it.

14,661. As much so as in the town?—No.

14,662. Have you any special instances to give us of the bad results of people not evacuating a village?—Yes; Sandhasal and Savali. We could not evacuate them during the rains. In other cases where we could evacuate the villages, the evacuation was very satisfactory; the disease stopped very soon after they went into the fields.

14,663. Have you any instances where villagers evacuated the village voluntarily of their own accord?—Yes; the inhabitants of the villages of Bahutha and Lasundra went out into the fields as soon as they found that rats were dying in their villages.

14,664. With regard to the villages, what are the measures which the people now regard as so valuable that they will adopt them of their accord?—Evacuation.

14,665. Have you any corpse inspection in the villages?—Yes; we had a medical official for each circle of villages, and he used to go and inspect sometimes.

14,666. Does that produce irritation among the people?—One has to do it with very great tact.

14,667. Did you notice among the villages any decrease in virulence as the epidemic drew to an end?—Yes; in Savali itself. There were more cases of cures towards the latter part of the epidemic than at the commencement.

14,668. (*The President.*) What is the size of these villages, generally?—Some of them have a population of 4,000, and some—Savali, for instance—have a population of about 6,000, while others have something like 1,000 people, and even less.

14,669. What is the population of the largest village in which you had complete evacuation?—4,000.

* *See* Appendix No. LI. in this Volume.

14,670. How long did you take to effect the evacuation?—Less than a week.

14,671. I understand you had three health camps?—Yes, at Baroda.

14,672. How many persons were there in them?—Over 11,000.

14,673. How many cases of plague occurred after evacuation among those 11,000 people?—Nine.

14,674. Within what time did those nine cases occur?—Within a week of the persons going to the camps.

14,675. It therefore looked as if there was no fresh infection in the camps?—That is so; there was no fresh infection in the camps.

14,676. You had a large number who went into the open fields?—Yes.

14,677. How many?—I think about 40,000.

14,678. Do you know how many cases of plague occurred among those people?—I could not make that out.

14,679. Is it possible to get that information?—No; I tried to, but I could not. Some cases occurred there which were surreptitiously put into houses in the city at night, and therefore some cases have been put down in my returns as having occurred in the city which actually occurred elsewhere.

14,680. Relatively to the population was the number large or small?—Smaller than if they were in the city.

14,681. You have had some experience of inoculation, I think?—Yes.

14,682. Was it carried on in conjunction with evacuation?—As a sort of experiment. The first inoculation was at Undhera, a village of about 1,000 population. Mr. Haffkine has reported separately about it.

14,683. Is that the only village?—No; we carried out inoculations in other villages also.

14,684. Was that before or after evacuation?—It was partial evacuation only. After the inoculations were done we evacuated the whole village.

14,685. You did not find that partial evacuation could be sufficiently supplemented by inoculation to make it necessary to do any more?—We had no patience to make an experiment of that kind.

14,686. You would not be justified in doing it?—No; not so; but the great object was to save the people without loss of time.

14,687. How long were the people kept out of their villages?—Between six weeks and two months. It so happened that afterwards the people would not go back themselves.

14,688. They liked the life of the camps?—Yes.

(Witness withdrew.)

Mr. MAYNARD called and examined.

14,689. (*The President.*) What are your medical qualifications?—M.R.C.S., L.R.C.P., D.P.H.

14,690. You have an appointment in connection with plague, I believe?—I came out to India in October, 1897, with the first batch which came on special plague work.

14,691. Where have you been mainly occupied?—For four months on plague duty in Nasik, and then I was made Civil Surgeon at Nasik for nine months. Now I am at Broach. I have been there for the last fortnight.

14,692. (*Dr. Ruffer.*) You have seen a great deal of plague in Nasik?—Yes; I saw most of the plague there, both in the district and in the city.

14,693. How do you think plague is carried from one village to another?—By the villagers in their ordinary course of moving from one village to another, generally by the class which corresponds to that of grocers, people who deal in small quantities of grain. It was noticed at first more particularly among the grain-sellers in Nasik.

14,694. Is that because the bacillus is in the grain, or because the grain merchants go from one village to another?—I do not think it has anything to do with what they deal in. I think it is because the people travel from one village to another.

14,695. Have you any evidence to show that it can be carried by rats from one village to another?—No direct evidence, but I was in medical charge of the plague work in the Nasik district this year, and I noticed in one village in particular, Ghoti, there was a case in the Post Office, a woman who had been visiting some relations in an infected place in the Arkoli taluka, in the Ahmednagar district. When she was discovered, three or four dozen dead rats were found in the same house. Then before any other case was found in Ghoti among human beings, several dead rats were found scattered in different parts of the village.

14,696. Was the Post Office in the village itself?—Yes; right in the middle.

14,697. How do you know there were no plague cases in the village at the time? Was there was a roll-call?—The Mamlatdar there was a very energetic man. Ghoti was only six miles from his headquarters, and he used to go there. It had become the routine for the Mamlatdar to visit the villages in his taluka once a week.

14,698. Supposing there had been a case of pneumonic plague, do you think you would have known of it?—No.

14,699. In that village the disease was brought by human agency?—Yes.

14,700. Did the disease spread among rats before it spread among the people?—Yes.

14,701. Did the disease spread very much in that village afterwards?—I got there before there was a second case, and I cleared the whole village out at once. Then we got a few scattered cases within the next 10 days.

14,702. Did you disinfect the village?—No; we did not do any disinfection at all.

14,703. How long did you wait before you allowed the people to return?—I was on the point of getting them back, when I was transferred to Broach.

14,704. Do you know when the people went back?—No.

14,705. You do not know whether there have been cases since?—No; I have not had any returns since then. But it was noticed in Nasik city during the epidemic that there were 26 imported cases before there was one indigenous case and three days before the first indigenous case there were about a dozen dead rats found round the house in which the first indigenous case was discovered.

14,706. Were the imported cases bubonic or pneumonic?—Practically all bubonic. There were very few pneumonic.

14,707. Was the first indigenous case bubonic or pneumonic?—Bubonic.

14,708. Do you know of any houses in which both pneumonic and bubonic cases occurred?—I have not noticed that point.

14,709. Have you ever traced a bubonic case to a pneumonic case?—No, I have not. During the whole of the Nasik epidemic there were only five pneumonic cases which were diagnosed as plague.

14,710. Did they occur in the same house?—No. Three were among police sepoys. They were all in the same lines, but not in the same house. Those were taken to the Civil Hospital and diagnosed there.

14,711. Did you find that pneumonic cases got the disease from either pneumonic or bubonic cases?—No, I have no evidence on that point.

14,712. You think that the contact of healthy persons with those suffering from the disease under conditions of mal-hygiene is the chief condition which spreads the plague?—Yes.

14,713. Why do you think that?—Because I contrasted the cases which have been treated by me in private buildings with those treated in hospital. While I was acting as Civil Surgeon at Nasik, which was over nine months, we had several cases which I treated in the old Civil Hospital in the heart of the city. It

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was well ventilated, and every morning the floor was saturated with perchloride of mercury, 1 in 1,000, and there was never a case occurred among the attendants nor in the houses surrounding the hospital.

14,714. You think that the friends and attendants of patients are really in much better hygienic conditions in the hospital than if they remained at home?—Infinitely better.

14,715. Would that explain the fact that very few attendants and friends of the patients get it?—Yes.

14,716. You think that overcrowding is the chief cause of the disease?—Yes, and the habit the people have in the cold weather of shutting up every aperture in the rooms and crowding into small rooms.

14,717. Do you think there is any special danger in pneumonic cases?—Yes. I am afraid I do not go by what I have seen myself, but by the cases I have heard of in Europeans which have been contracted from cases of pneumonic plague.

14,718. Were those cases in the Europeans pneumonic or bubonic?—Pneumonic.

14,719. In those cases a pneumonic case gave rise to another pneumonic case?—Yes.

14,720. (*The President.*) Have you any knowledge of that?—I have no personal knowledge.

14,721. It is a mere rumour?—I know someone who saw the case of Dr. Manser.

14,722. (*Dr. Ruffer.*) Do you think clothing can infect people?—Yes, I think so.

14,723. Have you any facts to show that?—No; I had no material for bacteriological examination.

14,724. Have you any facts showing that the disease has been traced to infected clothing?—No; what I attach most importance to is that the natives in the district I have lately come from are firmly convinced of it themselves, and they will never take any article of clothing from a house in which there has been a case of plague. In this recrudescence the people are much easier to control there. They do not mind their clothes being burned if it is impossible to disinfect them—things such as razais.

14,725. Have you any experience of evacuation?—Yes.

14,726. Do you think it would be successful in a large town?—It was successful in Nasik which has a population of 25,000.

14,727. Did you evacuate the whole town?—Yes, except a small street in which most of the shops were. We found it was impossible for the people to get their supplies without leaving a row of shops.

14,728. Can you tell us something about the evacuation at Nasik?—It was carried out gradually.

14,729. When did plague break out?—In 1897. October 12th was the first indigenous case. I got there on October 22nd, and I found them simply disinfecting the houses with what was supposed to be a solution of perchloride of mercury of 1 in 1,000 but was not.

14,730. What was it?—It was simply a much weaker solution with most of the salt at the bottom. It was left to people who did not know how to make the solution. They were evacuating just the houses immediately around the infected house. Then they evacuated streets, and last of all evacuated whole quarters, until they had evacuated the whole town except that one row of shops. The people were allowed to go into that row during the day and do their business and camp in the jungle at night.

14,731. What was the mortality from plague at Nasik?—The total mortality was 486.

14,732. In how many days?—From the 3rd February 1897, to the 8th April 1898. There was plague raging in a village 30 miles away, so that all cases were counted, both imported and indigenous. The great bulk of the cases occurred between the 12th November 1897, and the 21st January 1898.

14,733. When did you evacuate the town?—Evacuation commenced on the 11th November 1897, and finished in the early part of January 1898.

14,734. Then you still had dropping cases?—Yes; scattered cases occurred. It is very cold at Nasik, and the thermometer goes down to near 40° Fahr. at night, and we could not entirely keep the people out of the houses at night. We had police patrols, but we could not keep them out of the houses; we used to find them in the houses.

14,735. They went back to the town?—Yes.

14,736. How many people left the town and went into surrounding villages?—We could never find the exact number, because we had not a sufficient staff.

14,737. Do you think a great many went?—Yes; a great many.

14,738. How many, do you think?—I should think about one-eighth of the population, perhaps 3,000.

14,739. They left the place?—Yes; and went to villages near and infected them,

14,740. When did the mortality show any signs of decreasing after the evacuation was complete?—It showed it at once.

14,741. Have you a table showing that?—Yes; it is a table showing the cases as they occurred from week to week. The evacuation of those parts of the city in which the measure was thought to be necessary was begun on November 11th 1897, and was completed by about January 10th, 1898, and the table shows the number of plague cases occurring within the Nasik Municipal limits for the same periods, and until the end of the epidemic in the Nasik city. It is as follows:—

Week ending	Cases.	Deaths.
12th November, 1897	25	—
19th " "	48	—
26th " "	32	—
3rd December "	29	—
10th " "	30	—
17th " "	33	—
24th " "	42	—
31st " "	59	—
7th January, 1898	38	—
14th " "	34	—
21st " "	13	—
28th " "	10	—
4th February "	6	—
11th " "	3	—
18th " "	5	—
25th " "	5	—
4th March "	3	—
11th " "	6	—
18th " "	7	—
25th " "	3	—
1st April "	—	—
8th " "	—	1

14,742. Did you disinfect the people before they went into camp?—No.

14,743. Did you disinfect them before they returned to the town?—We did at the beginning, but we found it was a failure, because they would select some of their clothes to be disinfected, and then go back to their camps and bring the rest of their clothing in. They would get a pass for their clothing which was disinfected, and bring in other clothing which had not been disinfected; you could not describe every article.

14,744. You had not sufficient staff to search the houses?—No.

14,745. Did you limewash the place or disinfect it—We limewashed the houses after disinfection.

14,746. When the people returned into the town were there any more cases of plague?—No; only a few scattered cases which were all traced as having been imported.

14,747. Do you think the plague can be carried by air, by draughts?—No; I do not think so, not from house to house.

14,748. Do you think it can be carried any distance in a room by air?—Not if it is a properly ventilated room. I think it has to be concentrated before it has any effect.

14,749. Do you think a mild bubonic case would be infectious?—I have always treated every case as infectious, but I have no evidence to show that such cases would be.

14,750. Do you think pneumonic cases and septicæmic cases are extremely infectious?—Yes.

14,751. You have no evidence to lead you to suspect that plague may be carried either by food or drink?—No.

14,752. Or by insects?—I have always thought that flies and bugs would carry it.

14,753. Fleas?—Yes; but I have no evidence upon that. I have no bacteriological material.

14,754. I thought perhaps you had some clinical cases referring to the propagation of the disease by flea-bites?—No.

14,755. (*Mr. Cumine.*) Have you seen anything of plague in villages this season?—Yes; I was in the villages in Nasik until the 10th of January.

14,756. Have you noticed any case where a village has, without any traceable infection, been infected this year which was not infected last year, but which is next door to a village which was infected last year?—I do not know any. There are villages where they had only imported cases last year which have had local cases this year.

14,757. Without your being able to trace the new infection?—No; I have not seen any village where it has not been traced to an infected place. I understand that you mean that it was lying dormant from season to season. I have not seen any village in which the infection has not been traced to another place, as brought from thence by human agency.

14,758. Amongst the villagers who have had experience of plague before, which are the measures that they are so convinced of the usefulness of that they will adopt them themselves?—I went this year to Ghoti (where they had a riot, and tried to kill the people engaged in plague duty last year), and had the whole village turned out. They turned out willingly, and finished the evacuation in three hours. Two inches of rain fell about a fortnight afterwards during the night, and yet they did not go into the village, although they were in little huts made of bags and things of that kind, and had no shelter at all. They were so convinced of the efficacy of evacuation that even then they did not return to their village.

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14,759. Do they appreciate that it is not only necessary to evacuate, but to refrain from visiting the infected site?—Yes.

14,760. Do they understand the danger of admitting into their villages anyone from an infected village?—Yes; they thoroughly understand that in places where they have had plague before. They would not allow anyone to go in.

14,761. You say, I think, that they quite understand the danger of taking clothes from an infected house?—Yes; because they do not make any objection now to things that cannot be disinfected, such as razais, being destroyed by fire.

14,732. After they have evacuated the village, when they are out in the huts, do they of their own accord keep a watch upon the health of their neighbours and isolate any person who may be infected?—Yes; they put a little hut up a few yards away from their own place, and put the patient in it, and appoint someone to carry food and drink to the patient, and generally look after him. This attendant sleeps in another shelter near.

14,763. Do they believe in the disinfection of their houses?—No; I have never been able to make them see the benefit of that.

(Witness withdrew.)

Mr. NOWROSJI D. DESAI called and examined.

Mr. N. D. Desai.

14,764. (*The President.*) What appointment do you hold in connection with plague?—I was Hospital Assistant on plague duty in the infected districts in the Baroda territory.

14,765. Where did you get your medical education?—I am of the Baroda School.

14,766. What qualification do you hold?—I hold the diploma of Hospital Assistant from the Baroda Government.

14,767. I think you have some remarks to make with regard to the plague?—Yes. They are as follows:—As many competent medical men do not agree on the importation of the plague in Bombay, it is beyond my reach to speak for the same. I must own that, on account of want of proper studies in the theory of the germs, I am unable to submit my personal view in the matter. As the damp exceeds in the ground after a rainfall, and by decomposing vegetable matters it produces malaria, so the infection is a soil-bred disease produced in the earth. Climatic conditions suit the infection, and thereby it is active after the rains are over, when the excessive heat of October brings up the gas which is collected under the ground. As long as the poisonous gas is mixed in proper proportions with the other gases it is innocent, and does not harm the living beings on the earth; but, when it exceeds the other gases, it affects first the rats, &c. which live under the ground, and as the poisonous gas comes up it affects the human life living on the surface of the ground.* The rat, to imbibe pure air or to seek his food, comes out of his hole and seeks the interior of the house negligent of a human's presence, and thus spreads the infection. Or he dies in a granary, and the very poisoned grain, when used by man, may cause the disease. The absence of fresh air, light, and sunshine, or the presence of damp, dirt, &c., or the use of fungoid or unripe food, dirty habits, poverty, scanty clothings, deficient meal, crowded habitations, &c., are the auxiliaries to the growth of the disease. Bad water and disregard to the sanitary rules are also responsible for the infection. The infection may be carried from one place to another by the human agency. Sometimes the indolence of the stomach, weak health, empty stomach, long fastings, gluttony, &c., do not resist the growth of the plague bacilli. The infection seems to be subsided for a certain time; but it takes time to produce its progeny with double force, when it finds requisite heat, moisture, &c. The plague has no choice of place. It may appear in a dirtiest or a healthiest place. It is true that the plague may occur where a food with plague germs, or a food touched by an infected rat, may have come in the human use, but in many healthy villages, where there are no such foods, fungoid or mixed, of the plague germs, there, too, we find rats or men infected with the disease. Here, again, we see that the disease is a soil-bred one. The Indian people believe, from the most ancient times, that certain rainfalls produce the progeny of insects, while others kill them or destroy their eggs. The want of the rain of the last description helps the infection. From November to February, when the cold and unpleasant north-east wind blows, the people shut their doors and windows to check their entrance, which helps the poisonous gas springing from the ground; and as the fresh air does not mix with it, the inhabitants imbibe the foul air during the night, and thus become an easy prey to the fell disease. The Walkis, Doobars, Banjaras, shepherds, &c., who live in the open air, for the nature of their avocations, do not get infection on account of the pure air, sunlight, &c., they enjoy in superiority to those who live in Basti. It is true that the men, by the intercourse with the infected men or places, carry infection. The disseminator of infection—the Dhobi (washerman)—should not be lost sight of. When the atmosphere is charged with that foul air, or air charged with the plague germs in excess of the pure air, the plague takes a virulent form, and the people die on the roads doing business or duty. Be it added, in justice to Indian philosophy, that God sends such visitations to chastise and correct the overgrowth of Atheism and Materialism.

14,768. How do you reconcile the gas theory with the germ theory?—The germs may be produced by a poisonous gas.

(Witness withdrew.)

(Adjourned till to-morrow.)

* A sewer contaminated with night-soil, decomposing dirt, &c., is not less responsible to generate such poisonous gas. The choke-damp and fire-damp gases are well known to the Science, and so there may be a poisonous gas forming under ground unknown at present to the Scientists.

At The College Hall, Baroda.

FORTY-FIRST DAY.

Saturday, 4th February 1899.

PRESENT;

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President*).

Mr. A. CUMINE. | Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Mr. SHAMSUDIN J. SULEMANI called and examined.

Mr. S. J. Sulemani. 4 Feb. 1899.

14,769. (*The President.*) You are a Licentiate of Medicine of the Bombay University and the Chief Medical Officer in the Baroda State?—Yes.

14,770. I believe you have made some observations on the value of nitric peroxide as a disinfectant?—Several experiments were made in the laboratory with badly smelling liquids, including sewage, pea soup in a state of decomposition, and so on. Then several kinds of gases were passed through them, such as sulphur fumes, dammar fumes, chlorine gas, and nitric peroxide, and I found that the results with nitric peroxide and chlorine were the best. The smell was completely destroyed, whereas in the other cases it was not.

14,771. What were the relative quantities of these substances?—An equal quantity of gas, chlorine, and peroxide was taken.

14,772. How were the dammar fumes obtained?—By burning a fire, and the same with the sulphur fumes.

14,773. How did you measure the quantities?—It was not practicable to measure exactly, but it was done by guess. We passed a quantity of dammar and sulphur fumes until the smell considerably diminished. We passed the fumes over and over again, as we could not properly regulate the quantity.

14,774. The quantity was regulated by the effect?—Yes, and ultimately it was found that the smell did not disappear, no matter how much quantity of those gases was used.

14,775. You also made some experiments with chloro-nitrous ozone?—That is for disinfecting the houses only, but the others were experiments conducted in the laboratory.

14,776. Did you make any observations as to the diffusive power of these gases?—No, merely with regard to the smell.

14,777. Do you know if any information exists as to the penetrative power of those substances into tissues such as clothing?—I have not made them, but Professor Haffkine made certain experiments in Bombay. His experiments show that the power of diffusion and penetration is limited in the case of nitric peroxide.

14,778. You mean that it is small?—He did not make comparative experiments, because I requested him to make bacteriological experiments with nitric peroxide. His report shows that the power of diffusion and penetration with regard to this gas is limited.

14,779. You mean that it is small?—Yes, what he says is that it is limited. In one experiment plague bacilli were found to be dead.

14,780. You have also applied nitric peroxide in the disinfection of houses?—Yes.

14,781. With what result?—A certain number of infected houses were disinfected with a lotion of perchloride of mercury alone, and others with nitric peroxide only. The result shows that in the case of the houses which had been treated with perchloride of mercury the percentage of cases that recurred was three times as much as that in those which had been disinfected with nitric peroxide.

Name of Disinfectant.	No. of Houses disinfected.	No. of Plague Cases that occurred after Disinfection.	Percentage of Plague Cases.
Perchloride of mercury	134	17	12·6
Nitric peroxide - -	47	2	4·2

14,782. You have also made experiments on houses with peroxide of sulphur and chloro-nitrous ozone?—Yes, the results were as follows:—

Name of Disinfectant.	No. of Infected Houses disinfected.	No. of Houses in which Cases occurred after Disinfection.	No. of Cases that occurred.	Percentage of Attacks after Disinfection.
Nitric peroxide -	119	2	2	1·6
Sulphur and dammar fumes.	85	5	7	8·2
Chloro-nitrous ozone	21	2	2	9·5

14,783. What is your general opinion of the results of these latter experiments?—My own personal observation is that whenever houses were thoroughly disinfected with nitric peroxide along with other disinfectants, cases, as a rule, did not recur. I do not depend solely upon the nitric peroxide, because for disinfecting drains and so on it is necessary that we should use some liquid disinfectant. A great many houses were disinfected with perchloride of mercury.

14,784. You have a statement showing plague seizures and deaths from 1896 to 1898?—Yes, it is as follows:—

STATEMENT showing PLAGUE SEIZURES and DEATHS at certain PLACES, their POPULATION, and the RATE of ATTACKS per 1,000 of Population.

Names of Places.	Population.	Year 1896-97 from September 1896 to 30th July 1897.		Year 1897-98 from 31st July 1897 to 29th July 1898.			
		Seizures.	Deaths.	Seizures.	Deaths.	Rate of Attacks per 1,000 of Population.	Rate of Deaths per 100 of Attacks.
Baroda - - -	112,471	7	7	1,604	1,273	14·2	79·3
Surat - -	109,229	59	46	2,562	1,788	23·4	69·7
Billimora - -	5,915	128	92	8	66	14·7	75·9
Bulsar - -	12,999	902	703	351	218	27·1	62·1
Bet - -	4,625	2	2	33	28	7·1	84·8
Mandvi (Cutch) -	38,155	4,308	3,814	598	445	15·9	74·4

The above table shows the extent to which Baroda, Billimora, and Bet in the Gaikwar's Territory suffered from plague as compared with Surat, Bulsár, and Cutch Mandvi. In all these three places nitric peroxide had been used along with other disinfectants, whereas in the other places nitric peroxide had not been used, but other disinfectants. And the other measures, such as evacaution, segregation of contacts, and isolation of the sick, were resorted to in the same way as in the Gaikwar's Territory. In all those cases the conditions were the same, with the exception that nitric peroxide was used in Baroda, Billimora, and Bet.

14,785. (*Dr. Ruffer.*) What evidence have you that this gas has any bacteriological action whatever?—Professor Haffkine made several experiments, and in one experiment he found that the plague bacilli were destroyed by it. Those bacilli which came in close contact with dense fumes of the gas were destroyed, whereas those which were at some distance did not suffer in any way.

14,786. Did you close all the holes and crevices in the house?—No, but we only shut the doors and windows.

14,787. How did you produce dense fumes of the gas? Do you know of any gas which will kill microbes, placed inside the pocket of a coat for instance?—No, I do not.

14,788. (*The President.*) You have made some observations with regard to the prevention of plague by medicines?—Yes, with pills of quinine, ipecacuanha, camphor, and carbolic acid. The medical men connected with the different Plague Hospitals had been advised to take these pills as a preventive remedy. A number of medical men, nurses, and menials took them. The total number was 171, and the result was that only four people got plague, out of whom only one died and three recovered.

14,789. Is that contrasted with a group of people who did not take the medicines?—I compare this with what I read in the newspapers of certain medical men and nurses working in Plague Hospitals who died.

14,790. How many?—I think about half a dozen that I know of.

14,791. Out of how many people?—I have not statistics of that.

14,792. You used the medicines also with other people besides these servants and nurses?—Yes, but I commenced to use these pills in plague-stricken cases only about four months ago, in September.

14,793. Have you any statement showing the results?—I have a table which gives 15 villages, in which these pills had been used and plague disappeared. It is as follows:—

No.	Name of Village.	Population.	Date of First Attack.	Total Duration of the Epidemic.	Total Number of Attacks.	Total Number of Deaths.
1	Dhuntej	1,761	15.10.98	8	9	2
2	Nanibhadole	784	18.10.98	53	16	9
3	Gothada	—	4. 9.98	88	66	45
4	Samitpura	3,402	26.10.98	1	2	—
5	Chorepura	—	29.10.98	1	1	—
6	Namesra	905	8.10.98	59	24	16
7	Javla	324	23.9.98	66	25	19
8	Rasawadi	351	20.12.98	3	4	2
9	Dethli	1,225	21.8.98	60	73	47
10	Rasulpur	625	9.10.98	31	19	13
11	Gunglasun	788	9.10.98	37	23	15
12	Metrana	1,033	23.10.98	52	5	2
13	Kunwara	1,950	19.10.98	58	25	23
14	Karolia	827	22.11.98	1	1	—
15	Shiswa	960	11.9.98	34	27	21
	Total	—	—	552	320	214
	Average	—	—	36·8	21·3	14·2

Besides the above 15 places there are three more, namely, Savali, Sidhpur, and Sandhasal.

14,794. Have you any villages in similar conditions in which the pills were not used by the inhabitants?—Yes, I have collected statistics relating to 56 villages in Baroda, in which the pills were not used, which give the following results:—

No.	Names of Villages.	Population.	Date of first Attack.	Total Duration of the Epidemic in Days.	Total No. of Attacks.	Total No. of Deaths.	Remarks.
1	Gandevi	7,919	1.1.97	203	329	279	
2	Arthan	592	9.11.97	11	1	—	
3	Dhanori	1,081	24.2.97	10	3	3	
4	Chalthan	377	28.4.97	1	1	1	
5	Desad	264	8.3.97	1	3	2	
6	Gangor	268	2.7.97	6	5	4	
7	Gadat	990	30.1.98	63	36	26	
8	Delwada	542	17.3.97	13	3	3	
9	Varoti	746	3.3.98	37	5	4	
10	Pati	253	7.3.97	1	1	1	
11	Manekpur	619	2.7.97	75	10	10	
12	Kosmada	701	25.11.97	52	9	6	
13	Vadooli	244	30.3.97	1	1	1	
14	Ajrai	465	6.4.97	190	7	5	
15	Vadsangal	449	29.3.97	1	1	1	
16	Samrawadi	*	12.9.97	18	2	1	* This is a part of Dhamdachha, whose population is 267.
17	Bet	4,625	25.4.97	327	37	31	
18	Kadi	16,331	6.11.96	3	3	2	
19	Dindrol	1,019	5.2.98	30	26	21	
20	Gozaria	594	9.1.98	7	2	2	
21	Dhanawada	479	7.4.98	2	1	1	
22	Mehesana	9,985	18.2.97	70	25	19	
23	Mesar	1,784	27.12.97	47	88	56	
24	Methan	915	23.3.98	33	14	9	
25	Pachakwada	966	30.1.98	36	53	27	
26	Nidroda	886	28.3.98	1	5	1	
27	Kholwada	945	14.4.98	10	6	4	
28	Sandrana	1,213	6.2.98	44	76	56	
29	Kakoshi	1,733	10.2.98	57	81	64	
30	Patan	32,646	24.2.98	43	9	8	
31	Bhilwan	638	24.2.98	33	66	33	
32	Undhera	1,204	4.1.98	82	118	98	
33	Bajwa	703	24.1.98	71	47	37	
34	Padra	8,415	2.2.98	56	20	18	
35	Sakarda	2,115	22.2.98	95	71	60	

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No.	Names of Villages.	Population.	Date of first Attack.	Total Duration of the Epidemic in Days.	Total No. of Attacks.	Total No. of Deaths.	Remarks.
36	Kantharia	364	22.2.98	15	15	15	
37	Ankodia	926	21.4.98	35	6	5	
38	Ratanpur	268	22.2.98	39	63	47	
39	Koili	3,695	11.1.98	119	117	102	
40	Darap	2,462	3.3.98	24	2	2	
41	Goriad	1,071	9.3.98	3	5	5	
42	Dabhasa	2,474	2.4.98	1	1	1	
43	Vasana	1,651	5.3.98	25	18	17	
44	Tatarpur	343	6.3.98	1	1	1	
45	Korali	827	7.3.98	46	19	10	
46	Jarode	2,137	12.3.98	42	61	44	
47	Bhaniara	988	19.3.98	28	23	17	
48	Karodiya	526	16.3.98	21	6	6	
49	Amalpur	751	3.3.97	1	3	3	
50	Padamala	1,283	8.4.98	1	1	1	
51	Mochiapura	307	11.3.98	6	5	5	
52	Kapurai	523	21.3.98	1	1	1	
53	Tarasali	1,291	27.3.98	2	2	2	
54	Darajipura	—	14.2.98	18	4	4	
55	Jetalpur	650	10.2.98	44	4	4	
56	Akota	647	8.1.98	72	6	6	
	Total			2,274	1,528	1,192	
	Average			40·6	27·2	21·2	

Then I have another table with regard to Baroda city, which compares the last epidemic and the present epidemic, when the pills were used, as follows:—

1897-98.					1898-99.				
Week ending.	No. of Plague Cases.	No. of Plague Deaths.	No. of Deaths from all Causes.	Rate of Mortality per Mille of Population.	Week ending.	No. of Plague Cases.	No. of Plague Deaths.	No. of Deaths from all Causes.	Rate of Mortality per Mille of Population.
7.8.97	—	—	86	39·7	6.8.98	—	—	70	32·3
14.8.97	—	—	80	36·9	13.8.98	1	—	69	31·9
21.8.97	—	—	94	43·4	20.8.98	3	2	82	37·9
28.8.97	—	—	94	43·4	27.8.98	—	—	57	26·3
4.9.97	—	—	74	34·2	3.9.98	—	—	55	25·4
11.9.97	—	—	82	37·9	10.9.98	1	1	77	35·6
18.9.97	—	—	81	37·4	17.9.98	—	—	50	23·1
25.9.97	—	—	92	42·5	24.9.98	1	—	66	30·5
2.10.97	—	—	103	47·6	1.10.98	—	—	77	35·6
9.10.97	1	1	110	50·8	8.10.98	4	3	71	32·8
16.10.97	3	2	104	48·0	15.10.98	3	4	73	33·8
23.10.97	1	1	112	51·7	22.10.98	3	4	75	34·6
30.10.97	2	1	110	50·8	29.10.98	3	2	89	41·1
6.11.97	—	—	138	63·8	5.11.98	1	—	82	37·9
13.11.97	3	1	96	44·3	12.11.98	5	3	71	32·8
20.11.97	7	10	138	63·8	19.11.98	2	2	85	39·2
27.11.97	10	3	149	68·8	26.11.98	5	4	95	43·9
4.12.97	3	3	146	67·5	3.12.98	6	2	84	38·8
11.12.97	7	6	149	68·8	10.12.98	5	4	82	37·9
8.12.97	17	13	194	89·6	17.12.98	10	7	98	45·3
25.12.97	41	27	215	99·4	24.12.98	5	6	89	41·1
1.1.98	44	31	172	79·0	31.12.98	17	14	132	61·0
8.1.98	49	42	233	107·7	7.1.99	18	14	131	60·5
15.1.98	62	0	80	129·4	14.1.99	18	18	173	79·9
22.1.98	95	83	319	147·5	21.1.99	42	35	170	78·5
Total	345	274	3,451	—	Total	153	125	2,203	—
Average	13·8	10·9	138·0	63·8	Average	6·1	5·0	88·1	38·0

14,795. What do you say as to the general result of that?—The number of plague cases is much less, as shown by the tables, and the mortality from all causes is also much less.

14,796. What about the case mortality of plague?—It is about the same in each year.

14,797. The only thing that you claim is that the total number of plague cases was reduced?—Yes, and the total mortality from all causes also.

14,798. You are speaking of this only as a plague remedy, I understand?—Yes.

14,799. What has it to do with other diseases?—I have observed that before plague breaks out there is generally a high mortality from all causes.

(Witness withdrew.)

Mr. DHANJIBHAI H. MEHTA called and examined.

Mr. D. H. Mehta.

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14,800. (*The President.*) You are Licentiate of Medicine and Surgery of the Bombay University?—Yes.

14,801. And you hold the office of Medical Officer on Plague Duty at Baroda?—Yes.

14,802. (*Dr. Ruffer.*) You have been in charge of inoculation work in the Baroda State?—Yes.

14,803. Can you tell me how you ascertained the purity of Haffkine's fluid when sent to you?—We did not make any special examination, but we inoculated persons with it, and watched the results.

14,804. Did you ever reject any bottles of Haffkine's fluid?—Only one.

14,805. Why?—There was a sort of white button formed in it, a sort of fungus growth, which could not be dissolved by shaking.

14,806. How many bottles did you use altogether?—I performed about 2,000 inoculations, I think,—each bottle contains six doses—about 300 bottles.

14,807. You have only rejected one?—Yes.

14,808. How did you standardise the dose before injection?—It was put on the bottle.

14,809. You simply injected the dose written on the bottle?—Yes.

14,810. Did you take the temperature in each case?—In very few cases.

14,811. In how many cases?—About six or seven only.

14,812. What was the rise of temperature in these cases?—Generally 102. In one case it was 105; that was in the same arm in which it was injected.

14,813. Have you ever noticed any evil results from Haffkine's inoculations?—I have noted a few, but I do not know whether they were caused by the operation or were mere coincidences. Certain persons have complained of general debility and neuralgic pains, especially in the arm inoculated.

14,814. How long did the general debility last?—There were six persons who complained of general debility in the Baroda Central Jail, where we could watch the results very carefully. Out of these, five had no organic change, no wasting, and nothing specially noticeable about their constitution. Only one person is now suffering from general debility. He cannot walk without feeling giddy, but he has been admitted in the hospital some time back for dilatation of the heart.

14,815. Was that in the Baroda Jail?—Yes. Only one of those six cases of general debility has it now; although the others complain, they do their work as they used to do.

14,816. They are prisoners?—Yes.

14,817. And are not particularly anxious to work?—I inquired about them, and was told that three of them were rogues and used to malinger in order to shirk work. Some of them complained of neuralgic pains in the arm. At Billimora one person complained of pains in the arm, and said he could not do as much work as he did before. I examined his arm, but could not find any wasting or any structural change.

14,818. Have you noticed impotence following inoculation?—Dr. Cooper told me of two cases.

14,819. Apoplexy?—Yes, one died of it; his father also died of apoplexy.

14,820. How long after the inoculation?—About a month and a half.

14,821. Have you seen rheumatic arthritis following the injection?—There is one case in jail just now who has rheumatic arthritis, and there is another case reported by Dr. Cooper. Dr. Cooper tells me he saw one case, but as he has not seen it since he does not know whether it was merely a coincidence or not. The man in the jail has still got his knee-joint affected. Then one man has fissures on the dorsum of the hand. He works in carpet, and it might be the result of that work, or due to the excessive cold prevalent this year. Then the man with the general debility and with dilatation of the heart had giddiness. Two women in the jail complained of an increase in the length of the menstrual period, preceded by fever. One of these had influenza. She has been admitted for influenza in the hospital, and she cannot tell me whether the increase of flow was after or before the influenza.

14,822. Did the other woman complain of increased flow of blood during the menstrual period?—Yes, and increase of length of the period also.

14,823. Have you ever seen plague in a menstruating woman?—I have seen a case of plague where menstruation came on after she was attacked—after three or four days. She recovered.

14,824. Have you seen good results from inoculation quite apart from its effect on plague?—Yes; the dissipation of neuralgic pains, and consequent greater energy to walk. Three men voluntarily told me, while I was working at Gandevi, that they used to suffer from pains in the waist and limbs, and could not walk a long distance. After inoculation those pains disappeared, and they could walk with greater energy and for a greater length of time.

14,825. (*The President.*) Was it rheumatism?—Lumbago, I think.

14,826. (*Dr. Ruffer.*) Anything else?—Yes; one case had an attack of quartan malarial fever which disappeared after inoculation without his taking any quinine or anything. There was one case of polyuria; the patient used to get up two or three times at night to pass water; after inoculation he told me he only passed it once.

14,827. Had that man got diabetes?—No, I examined the urine after he made the statement, and could not find any sugar or any extra acidity in the urine. Another man's body was half covered over with ringworm, and he used to suffer a great deal from itching, which disappeared after inoculation.

14,828. I think you mention in your précis an improvement in a case of anæsthetic leprosy?—Yes; I noticed a case in jail. The man told me that the improvement was very marked since he had been inoculated.

14,829. Did you ever see abscesses following inoculation?—No.

14,830. Did you ever see enlarged glands in the axilla after inoculation?—I noticed in two cases a very small enlargement.

14,831. How many cases did you examine after inoculation?—I think I must have examined quite 500 cases.

14,832. How many times each?—Generally once.

14,833. How long after the inoculation?—Generally on the second day after inoculation.

14,834. Now I will take you over all the places where you performed inoculation. In the first place will you put in Table No. 1 in your précis?—Yes; it is as follows:—

I. BILLIMORA.

Persons Inoculated.	Persons not Inoculated.	Attacks.		Deaths.		Per-centage of Attack.		Per-centage of Case Mortality.	
		Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
432	4,918	26	228	16	187	6·01	4·6	61·6	82·0

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From these figures it would appear that the protective value of the serum is very little, if any. But if comparison is made as regards the population of houses inhabited by inoculated persons in which cases occurred, the protective value seems fairly good, as will be seen from the following synopsis of investigation sheets:—

Houses.	Persons Inoculated.	Persons not Inoculated.	Attacks.		Deaths.		Per-centage of Attack.		Per-centage of Recovery.	
			Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
54	105	249	26	76	16	62	24·7	30·5	38·4	18·3

It must be mentioned here that out of the 26 attacks, two were within 10 days of the inoculation and six had very small doses. If these be eliminated the results would be found still more favourable, as will be seen below:—

Persons Inoculated.	Persons not Inoculated.	Attacks.		Deaths.		Per-centage of Attacks.		Per-centage of Case Mortality.	
		Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
432	4,918	18	228	9	187	4·1	4·6	50·0	82·0

The gross mortality for the three months up to December 20, 1896, before the first epidemic, was 4 persons under 5, 15 between 6 and 60, and 4 over 60; while before the second epidemic, for the three months up to February 3, 1898, it was 10 under 5, 25 from 6 to 60, and 9 over 60.

14,835. In that case the per-centage of attacks among the inoculated people is rather higher than among the uninoculated?—Yes, on the total population.

14,836. How do you explain that?—This is what actually happened; bu tI believe out of 26 cases which were attacked we ought to eliminate at least eight, because six had very small doses and two were attacked within 10 days, and so probably had the poison in them before inoculation.

14,837. What do you mean by "small doses"?—The serum we used was of half strength. We ought to have given 5 c.c., but one of these six persons had 3·5, and the rest 3 c.c.

14,838. Do you put in a table of attacks among the inoculated at Billimora, with particulars?—Yes, as follows:—

LIST OF INOCULATED ATTACKS IN BILLIMORA, WITH PARTICULARS.

No.	Name in full.	Age.	Caste.	Date of Inoculation.	Date of Attack.	Date of Death.	Date of Recovery.	Dose and No. of Bottle.
1	Jivan Devchand	45	Ho. Gola	9.4.98	16.5.98	18.5.98	—	5 cc. 2574
2	Dewali, wife of Fakir Hira	30	H. Sutar	26.5.98	27.6.98	—	12.7.98	3·6 cc. 2781
3	Sukha Jivan	40	Do.	14.6.98	19.6.98	26.6.98	—	4·8 cc. 2781
4	Dewali Zina	15	H. Gola	28.5.98	28.6.98	1.7.98	—	3 cc. 2779
5	Kashi, wife of Naran Gopal	28	H. Sutar	26.5.98	25.6.98	—	5.8.98	4·5 cc. 2781
6	Benki Vasan	20	H. Ghanchi	28.5.98	9.7.98	14.7.98	—	3·8 cc. 2779
7	Dhani Govan	25	H. Pancholi	24.7.98	28.7.98	—	8.8.98	4 cc. 2781
8	Kallia Chhipka	45	H. Kumbhar	2.5.98	30.7.98	1.8.98	—	3·5 cc. 2792
9	Kika Govan	12	H. Pancholi	24.7.98	7.8.98	10.8.98	—	2·4 cc. 2781
10	Vasan Doolabh	35	Do.	2.5.98	3.8.98	14.8.98	—	4 cc. 2792
11	Akhoo Fakir	50	Do.	24.7.98	11.8.98	12.8.98	—	4·5 cc. 2932
12	Nichha Chhiba	30	H. Sutar	26.5.98	9.7.98	—	18.8.98	5 cc. 2781
13	Itchha Girdhar	12	H. Gola	28.5.98	25.6.98	—	4.8.98	2·6 cc. 2779
14	Kankoo Girdhar	10	H. Gola	28.5.98	21.7.98	—	18.8.98	2 cc. 2779
15	Itchharam Jivan	20	H. Pancholi	2.5.98	9.8.98	10.8.98	—	3·5 cc. 2792
16	Diaria Kalia	40	H. Kumbhar	2.5.98	17.8.98	21.8.98	—	3·5 cc. 2792
17	Moria Kalia	55	Do.	2.5.98	21.8.98	24.8.98	—	3 cc. 2792
18	Nagar Sukha	55	H. Pancholi	2.5.98	7.8.98	8.8.98	—	3 cc. 2792
19	Narsi Panoo	12	H. Soni	28.6.98	29.9.98	3.10.98	—	1·5 cc. 2781
20	Manga Laloo	19	H. Koli	27.7.98	4.9.98	—	27.10.98	3·6 cc. 2780
21	Kashi Lakhoo	30	H. Sutar	19.5.98	1.10.98	—	27.10.98	4 cc. 2780
22	Sukho Lalla	18	H. Gola	17.5.98	25.10.98	29.10.98	—	3·5 cc. 2780
23	Manga Somla	16	H. Dubla	26.7.98	15.11.98	16.11.98	—	3 cc. 2780
24	Nandi Sukha	20	H. Sutar	4.6.98	30.10.98	—	27.11.98	3·5 cc. 2779
25	Bhikha Haria	25	H. Dubla	26.7.98	25.11.98	1.12.98	—	4 cc. 2780
26	Bhana Vithal	17	H. Ghanchi	22.4.98	2.11.98	—	6.12.98	2·4 cc. 2763

14,839. Did two cases get plague within 10 days after inoculation?—Yes, Nos. 3 and 7. No. 3 after seven days, and No. 7 after four days.

14,840. Did these people have the full dose?—One had 4·8 and the other 4 cc. I think they are full doses, because 4·8 is pretty full, and it was a woman who had 4 cc.

14,841. What is the per-centage of mortality in the inoculated people?—3·7 in inoculated, and 3·9 in uninoculated, if we take all the 26 cases.

14,842. How was the total number of the population ascertained in the first instance?—From a special census taken.

14,843. Before the inoculations?—No. For these figures we took a census only lately, about the 18th or 19th of last month.

14,844. That is after the inoculations had been performed?—Yes, but in 1891 a census was taken which showed 5,915 people.

14,845. There was no census just before the inoculation began?—No, but the figures would be about the same, because in the first epidemic about 400 people had died out of 600 (the difference between the census of 1891 and of 1899), and 200 or 300 had emigrated to

other parts. The population of Billimora was as follows:—

Up to 5 years	771
From 6 to 60	4,488
Over 60	91
Total	5,350

These figures were supplied by the Vahivatdar of Gandevi from a special census taken for the purpose.

14,846. Your figures are only approximate?—Yes.

14,847. You have given in your précis a synopsis of investigation sheets. Does that refer to actual plague houses?—Only those houses in which some inoculated persons were living, and in which either inoculated or uninoculated persons were attacked.

14,848. Will you put in the table?—Yes. In the following table will be found the synopsis of investigation sheets:—

Hours.	Persons Inoculated.	Persons not Inoculated.	Attacks.		Deaths.		Recoveries.		Per-centage of Recovery.	
			Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
64	105	249	26	76	16	62	10	14	38·4	18·3

14,849. What does the table show, in your opinion?—It shows that the per-centage of attacks was less amongst the inoculated than amongst the uninoculated. The per-centage of deaths also was less, because if these 105 people had suffered to the same extent as these 249 living in the same houses, there would have been 22 deaths from plague, and instead of that we had only 16, which means a reduction of 27·5 per cent. of mortality. That is why I say the results are favourable.

14,850. Why did you administer small doses?—Because some of the people wished for small doses. Another reason was that when I inoculated certain persons, they fainted in the presence of the people congregated, and that caused a scare.

14,851. Some of the inoculated people had multiple buboes, had they not?—Yes, five persons.

14,852. And they recovered?—Sixty per cent. of the inoculated recovered.

14,853. Why do you say in your précis that the appearance of a second bubo generally caused death in uninoculated persons?—Because I have noticed it. Out of 19 cases which occurred among the uninoculated, only three recovered, and the rest generally died within a day or two after the appearance of the second bubo.

14,854. What is the per-centage of mortality among the uninoculated people?—Eighty-two per cent.

14,855. Do you put in a statement of inoculated and uninoculated, with the results per castes?—Yes;—

*Statement of Inoculated and Uninoculated in Billimora, with Results per Castes.

Castes.	Population.			Attacks.		Deaths.		Per-centage of Attacks.		Per-centage of Case-Mortality.	
	Inoculated.	Uninoculated.	Total.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
Anavlas	53	219	272	—	4	—	3	—	1·8	—	75·0
Banniahs	7	725	732	—	4	—	3	—	0·5	—	75·0
Barodias	3	11	14	—	—	—	—	—	—	—	—
Bhois	1	—	1	—	—	—	—	—	—	—	—
Brahmans	22	52	74	—	2	—	1	—	3·8	—	50·0
Darzis	2	60	62	—	10	—	8	—	16·6	—	80·0
Dhers	1	70	71	—	—	—	—	—	—	—	—
Dublas	44	140	184	2	17	2	16	4·5	12·1	100·0	94·1
Ghanchis	46	248	294	2	15	1	11	4·3	6·04	50·0	73·3
Golas	56	166	222	5	15	3	15	8·9	9·03	60·0	100·0
Jains	9	190	199	—	20	—	15	—	10·5	—	75·0
Kachhias	2	8	10	—	—	—	—	—	—	—	—
Kolis	17	217	234	1	5	—	5	5·8	2·3	—	100·0
Kumbhars	18	136	154	3	13	3	10	8·9	9·5	100·0	76·9
Lohars	4	10	14	—	1	—	1	—	10·0	—	100·0
Machhis	3	818	821	—	28	—	24	—	3·4	—	85·7
Mahrattas	2	—	2	—	—	—	—	—	—	—	—
Mochis	10	29	39	—	1	—	1	—	3·4	—	100·0
Musalmans	6	574	580	—	35	—	27	—	6·09	—	77·1
Pancholis	44	47	91	6	21	5	16	13·8	44·6	83·3	76·1
Parsees	9	813	822	—	15	—	11	—	1·8	—	73·3
Sonis	26	70	96	1	8	1	7	3·8	11·4	100·0	87·5
Sutars	47	179	226	6	14	1	13	12·8	7·8	16·6	92·5
Total	433	4,782	5,214	26	228	16	187	6·01	4·8	61·6	82·0

14,856. You say, here that 10 communities, namely, the Anavlas, the Banniahs, the Brahmans, the Darzis, the Jains, the Lohars, the Machhis, the Mochis, the Musalmans, and the Parsees, had no case amongst the inoculated?—That is so.

14,857. Can you give us a list of the communities in which there were no deaths among the inoculated and uninoculated?—Yes; the Barodias, the Bhois, the Kachhias, and the Mahrattas. These castes had no case in either. The per-centage of attacks in the inoculated was less than among the uninoculated in six communities, (Note by witness on correcting proof of his statement:—Four, not six. See paragraph 3 (*a*) of my further report†) namely, Dublas, Ghanchis, Golas, Kumbhars, Pancholis, and Sonis, and more in two, namely, Kolis and Sutars. The per-centage of case mortality was less amongst the inoculated in Ganchis, Golas, Kolis, and Sutars, and more in Dublas, Kumbhars, Pancholis, and Sonis. (Note by witness on correcting proof of his evidence:—Please see paragraph 3 (*b*) and (*c*) of my further report.†) But though the attacks in the Kolis and Sutars showed a greater

* Witness desires to substitute for this an amended statement given in paragraph 2 of a further report by him, which is printed as App. No. LII. in this Volume.

† *See* App. No. LII. in this Volume.

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per-centage, virtually they had almost all recovered, and though among the Kumbhars and Sonis the per-centage of case mortality was higher, it is because all had small doses. The results seem decidedly unfavourable as regards the Dublas and Pancholis, but that is really not the case, for if the inoculated Dublas had suffered to the same extent as their uninoculated relatives, they should have had proportionately to their number five deaths. They have actually had two only. The number is thus reduced by three, which means a reduction of mortality by 60 per cent.

14,858. Were the number of attacks greater in that caste?—The per-centage of attacks in the Dublas was less.

14,859. Then why do you think the results seem unfavourable? — Because so many died. Two were attacked and two died; the case mortality was 100 per cent. Again, if the inoculated Pancholis had suffered to the same extent as their uninoculated relatives, they should have had 15 deaths instead of five. The actual number is reduced by 10, which means a reduction of 66·6 per cent. in mortality.

14,860. You are of opinion that the virulence of the bacillus was very considerable?—Yes.

14,861. You say in your précis of evidence, "After "thorough evacuation of the street, and disinfection "of their premises, persons, personal effects, and fur-"niture, only one case occurred amongst them." What street do you refer to?—Where the Pancholis lived.

14,862. Will you put in Appendices A., B., and C. of your précis?—Yes.

APPENDIX A.

BILLIMORA.

STATEMENT of GROSS MORTALITY from PLAGUE and from all other CAUSES per WEEK from 20.12.96 (the date of the first case in the first epidemic).

Week ending	Plague.			All other Causes.		
	Up to 5 Yrs.	From 6 to 60	Over 60 Yrs.	Up to 5 Yrs.	From 6 to 60.	Over 60 Yrs.
26th December 1896	—	1	—	—	—	—
2nd January 1897	—	2	—	1	3	1
9th „ „	—	1	—	1	2	—
16th „ „	—	—	—	2	3	—
23rd „ „	—	—	—	—	2	—
30th „ „	—	—	—	—	5	0
6th February „	—	1	—	—	—	—
13th „ „	—	1	—	—	7	—
20th „ „	—	—	—	—	3	—
27th „ „	—	—	—	—	1	2
6th March „	—	6	—	—	—	—
13th „ „	—	2	—	—	—	—
20th „ „	—	1	—	—	2	—
27th „ „	—	2	—	—	—	—
3rd April „	—	—	—	1	7	1
10th „ „	—	1	1	1	2	—
17th „ „	—	7	—	3	—	—
24th „ „	—	5	—	—	3	1
1st May „	—	11	—	—	2	—
8th „ „	—	7	—	—	6	—
15th „ „	2	6	—	1	6	3
22nd „ „	—	10	—	1	6	1
29th „ „	—	7	—	1	6	2
5th June „	—	3	—	—	1	—
12th „ „	—	3	1	—	7	—
19th „ „	—	3	—	—	1	1
26th „ „	—	1	—	—	7	—
3rd July „	—	7	—	1	7	—
10th „ „	—	10	—	—	3	—
17th „ „	—	4	—	—	5	1
24th „ „	—	2	—	3	8	1
31st „ „	—	2	—	1	2	—
7th August „	—	—	—	—	5	1
14th „ „	—	1	—	1	13	2
21st „ „	—	1	—	—	11	2
28th August 1897	—	—	—	—	5	—
4th September „	—	1	—	1	6	2
11th „ „	—	1	—	—	9	2
18th „ „	—	5	—	1	3	2
25th „ „	—	2	—	2	9	1
2nd October 1897	—	1	—	1	10	2
9th „ „	—	1	—	2	7	—
16th „ „	—	1	—	—	5	1
23rd „ „	—	—	—	2	4	—
Total	2	120	2	27	194	29
	Grand total plague. 124			Grand Total other causes 250		
	Grand Total gross mortality, 374					

APPENDIX B.

BILLIMORA.

STATEMENT of GROSS MORTALITY from PLAGUE and from all other CAUSES per WEEK from 3.2.98 (the date of the first case in the second epidemic.)

Week ending	Plague.			All other Causes.		
	Up to 5 Yrs.	From 6 to 60.	Over 60 Yrs.	Up to 5 Yrs.	From 6 to 60.	Over 60 Yrs.
5th February 1898	—	—	—	—	2	—
12th „ „	—	1	—	—	1	2
19th „ „	—	—	—	3	1	1
26th „ „	—	—	—	1	2	1
5th March „	—	2	—	2	1	1
12th „ „	—	1	—	1	2	-
19th „ „	—	1	1	—	—	—
26th „ „	—	3	—	—	3	1
2nd April „	—	3	—	—	1	3
9th „ „	—	1	—	—	2	1
16th „ „	—	—	—	—	5	2
23rd „ „	—	1	—	—	—	—
30th „ „	—	1	—	—	—	1
7th May „	—	—	—	1	—	—
14th „ „	—	—	—	2	—	1
21st „ „	—	6	—	—	2	—
28th „ „	—	7	1	1	1	1
4th June „	—	2	—	3	3	1
11th „ „	—	2	—	—	2	1
18th „ „	—	1	—	2	2	2
25th „ „	—	4	1	1	2	1
2nd July „	—	3	—	—	3	2
9th „ „	1	2	—	1	3	1
16th „ „	—	3	—	1	4	—
23rd „ „	—	8	—	3	2	1
30th „ „	1	7	—	2	5	—
6th August „	—	11	—	1	4	—
13th „ „	—	8	—	2	1	1
20th „ „	—	9	—	3	1	1
27th „ „	—	13	—	1	—	2
3rd September „	—	9	—	1	2	—
10th „ „	—	12	—	1	2	—
17th „ „	—	6	—	2	1	1
24th „ „	—	6	1	2	2	1
1st October „	—	9	—	1	1	1
8th „ „	1	14	—	2	1	1
15th „ „	—	6	1	2	4	—
22nd „ „	—	9	—	—	3	1
29th „ „	—	2	—	—	1	—
5th November „	—	7	1	—	—	2
12th „ „	—	7	—	1	4	1
19th „ „	—	8	—	—	—	1
26th „ „	—	2	—	2	1	—
3rd December „	—	3	—	—	1	—
10th „ „	1	3	—	1	—	—
17th „ „	—	1	—	—	2	—
24th „ „	—	—	—	—	4	1
31st „ „	—	—	—	1	1	2
7th January 1899	—	—	—	1	3	3
14th „ „	1	2	—	2	1	1
Total	5	206	6	53	89	45
Grand Total	217			187		
Grand Total gross mortality	404					

N.B.—For purposes of convenience the first week was shortened.

APPENDIX C.

BILLIMORA.

STATEMENT of GROSS MORTALITY from PLAGUE in INOCULATED and NON-INOCULATED after the INTRODUCTION of INOCULATION.

Week ending	Inoculated.			Uninoculated.		
	Up to 5 Yrs.	From 6 to 60.	Over 60 Yrs.	Up to 5 Yrs.	From 6 to 60.	Over 60 Yrs.
9th April 1898	—	—	—	—	1	—
16th „ „	—	—	—	—	—	—
23rd „ „	—	—	—	—	1	—
30th „ „	—	—	—	—	1	—
7th May „	—	—	—	—	—	—
14th „ „	—	—	—	—	—	—
21st „ „	—	1	—	—	5	—
28th „ „	—	—	—	—	7	1
4th June „	—	—	—	—	2	—
11th „ „	—	—	—	—	2	—
18th „ „	—	—	—	—	1	—
25th „ „	—	—	—	—	4	1
2nd July „	—	2	—	—	1	—
9th „ „	—	—	—	1	2	—
16th „ „	—	1	—	—	2	—
23rd „ „	—	—	—	—	8	—
30th „ „	—	—	—	1	7	—
6th August „	—	1	—	—	10	—
13th „ „	—	4	—	—	4	—
20th „ „	—	1	—	—	8	—
27th „ „	—	2	—	—	11	—
3rd September „	—	—	—	—	9	—
10th „ „	—	—	—	—	12*	—
17th „ „	—	—	—	—	6	—
24th „ „	—	—	—	—	6	1
1st October „	—	—	—	—	9	—
8th „ „	—	1	—	1	13	—
15th „ „	—	—	—	—	6	1
22nd „ „	—	—	—	—	9	—
29th „ „	—	1	—	—	1	—
5th November „	—	—	—	—	7	1
12th „ „	—	—	—	—	7	—
19th „ „	—	1	—	—	7	—
26th „ „	—	—	—	—	2	—
3rd December „	—	1	—	—	2	—
10th „ „	—	—	—	1	3	—
17th „ „	—	—	—	—	1	—
24th „ „	—	—	—	—	—	—
31st „ „	—	—	—	—	—	—
7th January 1899	—	—	—	—	—	—
14th „ „	—	—	—	1	2	—
Total	—	16	—	5	179	5
Grand Total					205	

* Two of these occurred in cases that had occurred before 5th (viz., before inoculation).

N.B.—For the sake of convenience, the first week was shortened.

14,863. Have you anything to add to these tables?—You will see that the total of uninoculated has been given as 189 here, whereas in the statement of castes it is 187. I have given an explanation why there are two more here. These two more are there because these two deaths occurred amongst people who had been attacked before the 5th April, which was the first date of inoculation.

14,864. Can you give us the number of children inoculated up to 5 years, the number of people from 6 to 60, and the number of people over 60 who were inoculated?—Yes.

Inoculated.

Up to 5 years	16
From 6 to 60	415
Over 60	1

Uninoculated.

Up to 5 years	755
From 6 to 60	4,063
Over 60	90

14,865. Will you put in Appendix D.?—Yes.

APPENDIX D.*

BILLIMORA.

MONTHLY GROSS MORTALITY from all other CAUSES in INOCULATED and UNINOCULATED after the INTRODUCTION of INOCULATION.

Month.	Inoculated.	Uninoculated.
April 1898	—	14
May „	—	12
June „	1	21
July „	2	24
August „	1	17
September „	—	13
October „	2	16
November „	—	12
December „	1	12
January 1899 (up to 14th only).	—	14
	7	155

14,866. The per-centage of mortality in that table among the inoculated is higher than among the uninoculated, is not that so?—No. It ought to be 1·5 per cent. among the inoculated, and 3 per cent. among the uninoculated. (Note by witness on correcting proof of his evidence:—Please see paragraph 6 of my further report.)†

14,867. Then it was double as great among the uninoculated?—Yes.

14,868. How do you explain that?—I do not think it is possible to give any explanation. (Note by witness on correcting proof of his evidence:—Please see App. A2 and paragraph 6 of my further report.)†

14,869. When you inoculated people did you reject anybody?—Only those who actually had fever on them at the time, When we began inoculation we informed the people that those who had fever on them should not come forward.

14,870. Did you reject the sick?—No. Only we tried to give small doses to those persons who told us that they had any particular disease formerly.

14,871. Did you reject old people?—I do not remember that we rejected any.

14,872. In Appendix "C," which you have put in, you have got 90 people over 60 years of age who were not inoculated, five of whom died?—Yes.

14,873. Is not that a very high per-centage of mortality?—Yes, it comes to 55 per mille per annum.

14,874. What was the mortality among the 4,063 people from 6 to 60 years of age?—44 per mille per annum.

14,875. Among the inoculated people you only had one person over 60 years of age?—Yes. (Note by witness on correcting proof of his evidence:—There were really four; see App. A2 of my further report.)†

14,876. The majority of people were from 6 to 60?—Yes.

14,877. Can you say what the mortality from plague was up to five years of age among the inoculated and uninoculated?—There has been no death among the inoculated, but among the uninoculated (755) five died, which is a per-centage of 6·6 per mille per annum. In the statement which I have put in of inoculated and uninoculated, with results per castes, you will see that the total number of deaths among the uninoculated has been 187. I should say that really it ought to be more than that, because the total mortality from all other causes amongst the uninoculated from the beginning of the epidemic to the end has been 187. If we deduct those deaths which had occurred before the date of the first inoculation, namely, 33, the total of deaths from all causes amongst the uninoculated would be 154, which is a very high rate. At 30 per mille on 5,000 people it ought to be 121. That means that 33 deaths from plague have escaped notice.

* For this witness wishes to substitute App. A2 of the further report submitted by him, and printed as App. No. LII. in this Volume.

† *See* App. No. LII. in this Volume.

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14,878. You mean may have escaped?—There was no other epidemic going on at the time.

14,879. Can you prove that?—We can prove it only in this way. In a town like Billimora the highest mortality we could possibly take would be 30 per mille in the absence of any epidemic. Taking the general belief that when one epidemic is raging there is generally no other raging, and the fact that there was no epidemic prevalent at the time, that would mean that the deaths over 30 per mille must be concealed cases of plague.

14,880. I do not see why they *must*: if you say they *may* I agree. Why *must* they?—Because there was no other epidemic at the time, and the general mortality is 30 per mille.

14,881. Have you any actual proof that there must have been concealed cases of plague?—I say yes, because suspicious cases were allowed to pass.

14,882. Now we will go on to Undhera?—The first case of plague occurred on 22.12.97. The gross mortality from all causes for three months before that date had been as follows:—

Months.	Age.		
	Up to 5.	6 to 60.	Over 60.
From 22. 9.97 to 21.10.97 -	1	—	—
„ 22.10.97 to 21.11.97 -	1	—	—
„ 22.11.97 to 21.12.97 -	—	—	—
Total -	2	—	—

14,883. You put down the number of inoculated people as 513?—Yes.

14,884. What does M. Haffkine give in his report*?—The same.

14,885. The total number of uninoculated in your report is 518?—Yes.

14,886. What is it in M. Haffkine's report?—437.

14,887. Have you any explanation of the fact that the number of uninoculated in your report is 518, and in M. Haffkine's 437?—You will see by Appendix E. that 79 people had died from plague and from other causes before the 12th February, when most of the inoculations were done by M. Haffkine. These figures were not calculated by M. Haffkine in his report.†

14,888. Seventy-nine would bring it to 439?—Yes, there is a difference of two.

14,889. During that period of time, did any people die?—From the date of the first case, the 22nd December 1897, to the week ending 12th February, 79 persons had died. (Note by witness on correcting proof of his evidence:—This seems a mistake in calculation, as on reference to App. E., it appears 88 persons had died up to 12th February 1898.)

14,890. How many had been born—I suppose there had been some births?—I daresay, but I cannot tell you about that.†

14,891. You have the right figures among the inoculated, and no right figures among the uninoculated?—These figures are according to the census of 1891, that is before the epidemic came on there. (Note by witness on correcting proof of his evidence:—This statement was made by mistake.)

14,892. Then the figures which you have taken are simply approximate figures, if they are taken from the census of 1891. From 1891 to 1899 there is an interval of eight years, and during that time a number of people have been born, and a certain number have died. The figures can only be approximate?—A census was taken at the beginning of the epidemic also.

14,893. Do you mean a special census was taken in the houses by M. Haffkine?—No. A special census was taken at the beginning of the epidemic.

14,894. When was that census taken?—I cannot give you the exact date, but it was about the 22nd December 1897. (Note by witness on correcting proof of his evidence:—It was taken on 5th January 1898.)

14,895. How many people were there then?—1,036; viz., 188 up to 5 years, 834 between 6 and 60, and 9 over 60.

14,896. And you deduct from that —— ?—Seventy-nine persons who had actually died from plague.

14,897. And 513 had been inoculated?—Yes.

14,898. What is the average birth rate in a village?—I think there is an increase of population by 1 per cent. every year.

14,899. What is the total mortality; about 30 mille?—That is what we take.

14,900. Ought there not to have been six births in two months?—Yes. (Note by witness on correcting proof of his evidence:—Five were actually born.)

14,901. Will you put in the statement of castes?—Yes.

UNDHERA.

STATEMENT of CASTES.

Name of Caste.	Inoculated.	Uninoculated.
Brahmans - - -	31	33
Banniahs - - -	11	5
Patridars - - -	135	125
Darzis - - -	1	1
Sutars - - -	3	6
Lohars - - -	3	2
Barotes - - -	—	1
Bairagis - - -	—	2
Ghanchis - - -	1	—
Hajjams - - -	5	3
Gosains - - -	3	3
Barias - - -	180	149
Kumbhars - - -	1	6
Kolis - - - -	12	10
Vaghris - - -	16	34
Pagis - - - -	4	4
Musalmans - -	22	45
Ravalias - - -	3	2
Dhers - - -	37	40
Bhangis - - -	22	23
Khalpas - - -	23	24
Total - -	513	518

14,902. Did you inoculate half of each family?—Half of each sex, and half of each age, as far as possible.

14,903. I suppose the members of each family belong to the same caste?—Yes.

14,904. There were 11 Banniahs inoculated and five uninoculated?—Yes.

14,905. So that there were considerably more Banniahs inoculated than uninoculated?—Yes.

14,906. Then the Sutars, three were inoculated, and six uninoculated; and there 180 Barias inoculated, against 149 uninoculated, which is a considerable difference?—Yes, but we really do not know how many of these died from plague (between the date of census and 12th February 1898).‡

14,907. Then the Vaghris, 16 were inoculated, and 34 uninoculated; and 22 Musalmans were inoculated, against 45 uninoculated?—Yes.

14,908. Will you put in Appendix E.?—Yes.

* *See* App. No. III. in Vol. I.

† *See also* para. 8 of App. No. LII. in this Volume.

‡ Please *see* App. B. in App. No. LII. in this Volume.

APPENDIX E.*

UNDHERA.

STATEMENT of GROSS MORTALITY from PLAGUE and all other CAUSES per WEEK from 22.12.97 (Date of First Case).

Week ending	Plague.			All other Causes.		
	Up to 5 Yrs.	6 to 60.	Over 60.	Up to 5 Yrs.	6 to 60.	Over 60.
1st January 1898 -	—	6	—	—	—	—
8th „ „ -	1	8	—	—	—	—
15th „ „ -	—	9	—	—	—	—
22nd „ „ -	2	13	—	—	—	—
29th „ „ -	3	20	—	—	—	—
5th February „ -	1	15	—	1	—	—
12th „ „ -	2	7	—	—	—	—
19th „ „ -	2	8	—	—	—	—
26th „ „ -	2	11	1	1	—	—
5th March „ -	1	3	1	1	1	—
12th „ „ -	—	4	—	—	—	—
19th „ „ -	—	2	—	—	—	—
26th „ „ -	—	2	—	—	—	—
2nd April „ -	—	—	—	—	—	—
Total - -	14	108	2	3	1	—
		124			4	
Grand total, all causes - - -					128	

14,909. Could you add in all these statements the number of attacks, as well as the gross mortality from plague?—Yes. (Note by witness on correcting proof of his evidence:—This information will be found in App. B. of my further report.)†

14,910. Will you also kindly add the number of people up to 5 years, from 6 to 60 years, and over 60 years, who have been inoculated, and make the same statement with regard to the uninoculated people?—Yes. (Note by witness on correcting proof of his evidence:—This information is supplied, though with a slight difference, in App. C. of my further report.)†

14,911. The number of deaths among the uninoculated people is considerably higher than among the inoculated?—Yes.

14,912. Will you put in Appendices F. and G.?—Yes.

APPENDIX F.

UNDHERA.

GROSS MORTALITY from PLAGUE in INOCULATED and UNINOCULATED after INTRODUCTION of INOCULATION.

Week ending	Inoculated.			Uninoculated.		
	Up to 5 Years.	From 6 to 60.	Over 60.	Up to 5 Years.	From 6 to 60.	Over 60.
19th Feb. 1898 -	1	2	—	1	6	—
26th „ „ -	—	—	—	2	11	1
5th March „ -	—	—	—	1	3	1
12th „ „ -	—	—	—	—	4	—
19th „ „ -	—	—	—	—	2	—
26th „ „ -	—	—	—	—	2	—
2nd April „ -	—	—	—	—	—	—
	1	2	—	4	28	2

N.B.—Though Professor Haffkine's report contains 27 cases, with 26 deaths amongst the inoculated, five more had actually occurred, but as they occurred in a suburb where no inoculation was done, they were not taken into account by that gentleman. Three deaths occurred in cases that had occurred before 12.2.98, as mentioned in his own report.

* Instead of this statement witness wishes to substitute App. C. in App. No. LII. in this Volume.

† *See* App. No. LII. in this Volume.

APPENDIX G.

UNDHERA.

GROSS MORTALITY from all other CAUSES in INOCULATED and UNINOCULATED and UNINOCULATED after INTRODUCTION of INOCULATION.

Months.	Inoculated.	Uninoculated.
From 26th January to 25th February 1898.	1	1
From 26th February to 25th March 1898.	—	3
From 26th March to 25th April 1898.	—	2
From 26th April to 25th May 1898.	—	2
From 26th May to 25th June 1893.	—	—
From 26th June to 25th July 1898.	—	1
	1	9

14,913. With regard to Appendix G., what was the mortality from general causes among the inoculated?—1·9 per mille per annum.

14,914. And among the uninoculated?—Taking the figure 437 given by M. Haffkine, 25 per mille per annum.

14,915. The mortality from all causes then, excluding plague, was about 13 or 14 times as large in the uninoculated as the inoculated?—Yes; that is a difference of 92 per cent. (Note by witness on correcting proof of his evidence:—The difference was not anything like that; *see* paragraph 11 of my further report.)†

14,916. Then the inoculation had a very good effect on general diseases?—Yes.

14,917. How do you explain that?—I really cannot explain it. There is no special explanation that could be offered. (Note by witness on correcting proof of his evidence:—The explanation is given in paragraph 2 and App. C. of my further report.)†

14,918. Does it not seem to you to point to the fact that the people inoculated cannot have been of the same class?—They were mostly of the same class.

14,919. The diminution in the mortality from plague is less striking than the diminution of mortality from all other causes?—I think in rural villages the social condition is about the same in the inoculated and the uninoculated. Most of them are labourers or cultivators.

14,920. Do the people who have been inoculated get special advantages with regard to segregation or quarantine?—Yes; we gave them special advantages at Billimora.

14,921. Did they have them at Undhera?—No, because after inoculation they were all made to evacuate. Before inoculation half the population was evacuated, and after inoculation they were all evacuated.

14,922. Have they any special reason for concealing their deaths after inoculation?—I do not think so.

14,923. Then you have no explanation to offer?—None that I can think of.

14,924. Now with regard to Dhamdachha?—The first case of the first epidemic occurred on 17.2.9. That of the second epidemic is reported to have occurred on 28.2.98, and the first one of the third epidemic on 4.8.98. Inoculation work was begun on 13.4.98 (while the second epidemic was prevalent). The population was:—

Up to 5 years - - - - - -	354
From 6 to 60 „ - - - -	2,299
Over 60 „ - - - - -	123
Total -	2,676

These figures were supplied to me by the Gandevi Taluka Awal Karkun. No case of plague is re-

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ported to have occurred amongst the inoculated, but four occurred amongst the uninoculated in houses inhabited by inoculated persons, as will be seen from the following :—

SYNOPSIS of INVESTIGATION SHEETS. DHAMDACHHA.

Houses.	Persons Inoculated.	Persons not Inoculated.	Attacks.		Deaths.		Recoveries.		Per-centage of Recovery.	
			Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
3	3	8	—	4	—	3	—	1	—	25·0

The Gross Mortality for three months previous to 17.2.97 (the date of the first case in the first epidemic) was as follows :—

Months.	Up to 5 Years.	From 6 to 60.	Over 60 Years.
From 17th November to 1st December 1896.	3	6	0
From 17th December to 1st January 1897.	0	3	2
From 17th January to 1st February 1897.	3	11	3
Total - - -	6	20	5

The Gross Mortality for three months previous to 28.2.98 (the date of the first case in the second epidemic).

Months.	Up to 5 Years.	From 6 to 60.	Over 60 Years.
From 28th November to 27th December 1897.	1	3	2
From 28th December to 27th January 1898.	0	3	0
From 28th January to 27th February 1898.	0	6	1
Total - - -	1	12	3

The Gross Mortality for three months previous to 4.8.98 (the date of the first case in the third epidemic).

Months.	Up to 5 Years.	From 6 to 60.	Over 60 Years.
From 4th May to 3rd June 1898 -	2	8	2
From 4th June to 3rd July 1898 -	2	8	1
From 4th July to 3rd August 1898 -	5	12	2
Total - - -	9	28	5

14,925. Do you put in the numbers of inoculated and uninoculated per castes?—Yes, as follows :—

NUMBERS of INOCULATED and UNINOCULATED per CASTES.

Names of Castes.	Inoculated.	Uninoculated.
Kolis - - -	55	550
Brahmans - - -	49	67
Mahrattas - - -	1	1
Kachhias - - -	50	191
Darzis - - -	6	9
Kumbhars - - -	20	168
Anavlas - - -	29	547
Jains - - - -	7	33
Musalmans - - -	6	249
Lohars - - -	8	17
Sutars - - -	3	28
Hajjams - - -	1	7
Dublas - - -	1	Not known
Sonis - - - -	2	3
Machhis - - -	1	Not known
Dhers - - -	2	146
Total - -	241	2,016

14,926. May I point out there is a considerable difference in the proportion of inoculated to uninoculated in the different castes?—Yes, that is so.

14,927. For instance, among the Kolis you have 550 uninoculated against 55 inoculated, whereas in the Brahmans the proportion of inoculated to inoculated is much less?—That is so.

14,928. Again, in the Kumbhars and Anavlas, and in the Musalmans, the proportion is just the opposite and also among the Dhers?—Yes.

14,929. So that from the point of view of caste you cannot compare the inoculated with the uninoculated?—Not exactly.

14,930. Could you add to your figures the mortality from plague among these various castes, both among the inoculated and the uninoculated?—Yes. (Note by witness on correcting proof of his evidence :—Please see paragraph 19 of my further report.)*

14,931. Will you put in Appendices H. and I.?—Yes.

APPENDIX H.

DHAMDACHHA.

STATEMENT of GROSS MORTALITY from PLAGUE and all other CAUSES per WEEK from DATE of FIRST CASE in each of THREE EPIDEMICS.

Week ending	Plague.			All other Causes.		
	Up to 5 Years.	From 6 to 60.	Over 60 Years.	Up to 5 Years.	From 6 to 60.	Over 60 Years.
(First Case, First Epidemic on 17.2.97.)						
23rd Feb. 1897 -	—	2	—	—	2	—
2nd March „ -	—	—	—	1	3	1
9th „ „ -	—	8	1	—	—	—
16th „ „ -	—	5	—	—	6	1
23rd „ „ -	—	5	—	—	2	—
30th „ „ -	—	2	—	—	3	—
6th April „ -	—	5	—	—	5	4
13th „ „ -	—	4	—	—	—	2
20th „ „ -	—	3	—	—	4	—
27th „ „ -	—	—	1	—	2	2
4th May „	—	—	—	—	1	—
11th „ „ -	—	1	—	—	2	—
Total -	—	35	2	1	30	10
(First Case, Second Epidemic on 28.2.98.)						
6th March 1898 -	—	2	—	—	1	1
13th „ „ -	—	3	—	—	2	—
20th „ „ -	—	—	—	—	5	1
27th „ „ -	—	2	—	—	4	—
3rd April „ -	—	5	—	—	3	1
10th „ „ -	—	6	—	—	5	2
17th „ „ -	—	5	—	—	2	—
24th „ „ -	—	4	—	—	3	1
1st May „ -	—	—	—	—	3	2
8th „ „ -	—	—	—	—	2	—
15th „ „ -	—	—	—	—	2	—
Total -	—	27	—	—	32	8

* *See* App. No. LII. in this Volume

Week ending	Plague.			All other Causes.		
	Up to 5 Years.	From 6 to 60.	Over 60 Years.	Up to 5 Years.	From 6 to 60.	Over 60 Years.
(First Case, Third Epidemic on 4.8.98.)						
10th August 1898	—	1	—	—	4	—
17th „ „	1	1	—	1	1	1
24th „ „	—	—	—	—	1	1
31st „ „	—	—	—	—	—	1
7th Sept. „	—	—	—	—	1	—
14th „ „	—	—	—	1	1	—
21st „ „	—	—	—	1	1	—
28th „ „	—	1	—	—	2	—
5th October „	—	1	—	—	1	—
12th „ „	—	1	—	—	1	—
Total -	1	5	—	3	13	3

Grand total of three epidemics—

Plague deaths - - -	68
Other „ - - -	100
	168

APPENDIX I.†

DHAMDACHHA.

GROSS MORTALITY from all other CAUSES in INOCULATED and UNINOCULATED after INTRODUCTION of INOCULATION (12.4.98).

Months.	Inoculated.	Uninoculated.
From 13th April to 12th May 1898.	—	13
From 13th May to 12th June 1898.	—	14
From 13th June to 12th July 1898.	—	10
From 13th July to 12th August 1898.	1	15
From 13th August to 12th September 1898.	1	7
From 13th September to 12th October 1898.	—	7
From 13th October to 12th November 1898.	—	5
From 13th November to 12th December 1898.	—	6
From 13th December to 12th January 1899.	—	5
Total - -	2	82

14,932. With regard to Appendix I., will you give us the gross mortality per mille of the inoculated and uninoculated?—Yes, 8·3 per mille in the inoculated and about 40 per mille among the uninoculated. (Note by witness on correcting proof of his evidence:—Please see paragraph 17 of my further report.)‡

14,933. It is five times as great in the uninoculated? Yes.

14,934. Then inoculation has not only stopped plague, but it has had a good effect on other diseases as well?—Yes.

14,935. Can you offer any explanation of that?—No. (Note by witness on correcting proof of his evidence:—The explanation is given in the remarks in App. D. in my further report and in paragraph 18 of the same.)‡

14,936. Now with regard to Koili?—The first case occurred on the 8th January 1898. Inoculation was begun on the 22nd February, but most operations were performed on the 5th April by M. Haffkine.

14,937. Will you put in your synopsis of investigation sheets?—Yes, it is as follows:—

SYNOPSIS of INVESTIGATION SHEETS. KOILI.

Houses.	Persons Inoculated.	Persons not Inoculated.	Attacks.		Deaths.		Recoveries.		Per-centage.			
									Attacks.		Recovery.	
			Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
26	48	73	13	18	9	17	4	1	27·08	24·7	30·8	5·6

This table proves that (1) the per-centage of attacks in inoculated, living in affected houses, was greater than in the others; (2) but that the recoveries were much more in the former than in the latter; (3) also that the poison was evidently very virulent.

14,938. What was the per-centage of attacks amongst the inoculated?—27·08.

14,939. The per-centage of attacks there is higher in the inoculated than in the uninoculated, it being 24·7 for the latter?—Yes. But the mortality is less, for if the inoculated had suffered to the same extent as their uninoculated relatives, they should have had 11 deaths. The actual number is reduced by two, which means a reduction in mortality by 18·9 per cent.

14,940. Will you put in the list of inoculated attacks?—Yes, it is as follows:—

LIST of INOCULATED ATTACKS, with PARTICULARS.

No.	Name in full.	Age.	Caste.	Date of Inoculation.	Date of Attack.	Date of Death.	Date of Recovery.	Dose.
1	Makoo, mother of Natha -	50	H. Baria - -	13.3.98	14.3.98	14.3.98	—	4 c.c.
2	Natha Deshai - - -	15	„ - -	„	20.3.98	20.3.98	—	4 c.c.
3*	Bava Kala - - -	35	„ - -	22.2.98	23.3.98	28.3.98	—	5 c.c.
4	Nana Zaver - - -	25	„ - -	„	24.3.98	—	30.3.98	5 c.c.
5	Mela Garbad - -	25	„ - -	13.3.98	25.3.98	—	30.3.98	5 c.c.
6	Karsan Dabhai - -	35	„ - -	13.3.98	25.3.98	—	9.5.98	5 c.c.
7	Doola Zala - - -	25	„ - -	22.2.98	28.3.98	—	9.5.98	4·5 c.c.
8	Dhoola Poonja - - -	20	„ - -	13.3.98	29.3·98	29.3.98	—	3 c.c.
9*	Jita Amrá - - -	50	„ - -	„	6.4.98	8.4.98	—	3 c.c.
10*	Narotam Shidhar - -	25	„ - -	12.3.98	8.4.98	11.4.98	—	4·5 c.c.
11*	Jita, wife of Jesung - -	25	„ - -	13.3.98	9.4.98	11.4.98	—	5 c.c.
12*	Govind Karsan - - -	30	H. Hajjam -	5.4.98	10.4.98	10.4.98	—	3 c.c.
13*	Jibhai Daji - - -	50	H. Baria - -	13.3.98	18.4.98	19.4.98	—	3 c.c.

All marked * were bubonic.

† For this witness desires to substitute App. D. in his further report, printed as App. No. LII. in this Volume.

‡ *See* App. No. LII. in this Volume.

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14,941. There are three cases which got plague within 10 days after inoculation?—Yes, Nos 1, 2, and 12.

14,942. In the first case only one day elapsed?—Yes.

14,943. Was that a bubonic case?—I could not find any mention of it. (Note by witness on corrrecting proof of his evidence:—Please see paragraph 27 of my further report*).

14,944. In the second one there was a seven-days interval between the inoculation and the onset of the disease?—Yes.

14,945. And the third one five days?—Yes.

14,946. Of the remaining 10 you have an explanation for three?—Yes, they had small doses.

14,947. Will you put in your statement of castes?—Yes.

STATEMENT of CASTES.

Name of Caste.	Inoculated.	Uninoculated.
Pattidars	194	624
Barias	513	967
Barotes	3	24
Girasias Maule salam	4	33
Mochis	5	3
Rahbaris	4	23
Brahmans	24	54
Girasias	21	106
Kumbhars	10	14
Golas	7	6
Lohars	17	42
Kachhias	5	5
Sonis	5	11
Hajjams	27	33
Bhanjis	21	65
Tais	3	3
Borahs	2	14
Dhobis	1	2
Lohars	3	8
Musalmans	4	10
Chhipa	1	0
Khatris	1	9
Rajputs	12	23
Sutars	14	28
Bajanias	13	29
Vaghris	15	37
Fakirs	1	12
Dhers	37	70
Khalpas	24	13
Garodas	7	6
Not known	161	—
Total	1,159	2,274

POPULATION.

Up to 5 years	509
From 6 to 60	2,704
Over 60	58
Total	3,321

14,948. Again I would point out to you that the proportion of inoculated to uninoculated varies considerably in the different castes?—Yes, that is so.

14,949. With regard to the statement of population I believe you had a special census?—Yes, taken at the beginning of the epidemic.

14,950. Will you put in the statement of gross mortality from all causes for three months previous to the 8th January 1898, which was the date of the first case?—Yes, it is as follows:—

From 8th October to 7th November 1897	5
,, ,, November ,, December 1897	4
,, ,, December ,, January 1899	6
Total	15

* *See* App. No. LII. in this Volume.

14,951. Will you put in Appendices J. and K.?—Yes, as follows:—

APPENDIX J.

KOILI.

STATEMENT of GROSS MORTALITY from PLAGUE and all other Causes per WEEK from 8.1.1898 (*i.e.*, Date of First Case).

Week ending	Plague.			All other Cases.		
	Up to 5 Yrs.	6 to 60 Yrs.	Over 60 Yrs.	Up to 5 Yrs.	6 to 60 Yrs.	Over 60 Yrs.
14th January 1898	—	2	—	2	—	1
21st ,, ,,	—	—	—	—	—	—
28th ,, ,,	—	—	—	1	—	—
4th February ,,	—	—	—	1	—	—
11th ,, ,,	—	—	—	—	—	—
18th ,, ,,	—	3	—	—	2	—
25th ,, ,,	1	4	—	—	—	—
4th March ,,	—	11	—	1	1	—
11th ,, ,,	—	11	—	—	—	—
18th ,, ,,	2	14	—	1	1	—
25th ,, ,,	—	24	1	—	—	2
1st April ,,	1	22	2	1	3	1
8th ,, ,,	—	12	—	—	2	2
15th ,, ,,	—	10	—	2	1	4
22nd ,, ,,	—	4	—	—	—	2
29th ,, ,,	—	3	—	—	1	—
6th May ,,	—	2	—	1	1	—
Total	4	122	3	10	12	12

APPENDIX K.

KOILI.

GROSS MORTALITY from PLAGUE in INOCULATED and UNINCCULATED after INTRODUCTION of INOCULATION (*i.e.*, 22.2.98).

Week ending	Inoculated.			Uninoculated.		
	Up to 5 Yrs.	6 to 60.	Over 60.	Up to 5 Yrs.	From 6 to 60.	Over 60.
25th February 1898	—	—	—	1	4	—
4th March ,,	—	—	—	—	11	—
11th ,, ,,	—	—	—	—	11	—
18th ,, ,,	—	1	—	2	13	—
25th ,, ,,	—	1	—	—	23	10
1st April ,,	—	2	—	1	20	2
8th ,, ,,	—	1	—	—	11	—
15th ,, ,,	—	3	—	—	7	—
22nd ,, ,,	—	1	—	—	3	—
Total	—	9	—	4	103	3

14,952. Did a great many uninoculated persons die from general causes during that period?—Yes. No death is reported to have occurred from other causes among the inoculated. There were 1,159 inoculated, and no death among them.

14,953. How do you account for that?—I cannot.

14,954. Does not it strike you as peculiar?—Yes, the inoculations seemed to have a good effect on the general mortality.

14,955. What is the explanation of that good effect? Do you believe that you have accidentally stumbled on a universal cure, or do you think there is some fallacy in the statistics?—There is no fallacy in the statistics.

14,956. Then how do you account for it?—I cannot account for it. We looked up the names of the persons who had died and compared them with the register of inoculated persons, and found that none of those had died.

14,957. You have a considerable reduction of mortality from plague which you can understand as due to the inoculation, but how do you account for an even greater reduction in the general mortality?—I really cannot say.

14,958. Now with regard to Gandevi?—The first case of the first epidemic occurred on 25th December 1896, and that of the second on 28th January 1898. Virtually, however, there may be said to have been one epidemic, for the gross mortality of three months previous to the second epidemic is very high, as will be shown further on. Inoculation work was begun on 19th April 1898, after the subsidence of the second epidemic (*i.e.*, about a fortnight after the last reported case) under the orders of the District Magistrate Naosari, with a view to prevent a fresh outbreak if possible, as experience had shown that cases did occur in disinfected houses after the lapse of nearly a year. No indigenous case has been reported since the date of inoculation. The population according to Census of 1891 was:—

Up to 5 years - -	613
From 6 to 60 years -	6,934
Over 60 years - -	372
Total - -	7,919

The gross mortality for three months before 25th December 1896, when the first epidemic began, was 6 persons under 5, 16 between 6 and 60, and 5 over 60, while the figures up to 28th January 1898 for three months before the beginning of the second epidemic show a gross mortality of 19 persons under 5, 97 between 6 and 60, and 12 over 60.

14,959. Will you put in the table of castes?—Yes, as follows:—

TABLE OF CASTES GANDEVI.

Castes.	Inoculated.	Uninoculated.	Castes.	Inoculated.	Uninoculated.
Musalmans -	12	1,815	Dabgars -	5	Not known.
Parsees -	23	593	Anavlas - -	15	203
Banniahs -	29	695	Tambolis -	4	37
Brahmans -	38	344	Mahrattas -	2	76
Khatris -	47	484	Kolis - -	26	241
Pancholis -	33	177	Kumbhars -	10	230
Golas - -	39	389	Kunbis - -	1	8
Machis -	36	227	Rajbharas -	3	23
Kansaras -	11	238	Lohars - -	2	17
Dooblas -	23	673	Jains - -	1	102
Sutars - -	10	143	Kachhias -	1	96
Sagars -	8	Not known.	Darzis -	4	183
Sonis - -	9	97	Hajjams -	1	42
Mochis -	8	10	Dhers -	1	Not known.
Ghanchis -	9	74	Total -	421	7,681
Bhavsars -	10	464			

14,960. I would point out to you that in your table of of castes the proportion of the inoculated to the uninoculated varies exceedingly?—Yes.

14,961. Will you put in Appendices L., M., and N.?—Yes, as follows:—

APPENDIX L.

GANDEVI.

Mr. D. H. Mehta.

4 Feb. 1899

GROSS MORTALITY from PLAGUE and from all other CAUSES per WEEK from 25.1 2.96. (Date of First Case First Epidemic.)

Week ending	Plague. Up to 5.	Plague. 6 to 60.	Plague. Over 60.	Other Causes. Up to 5.	Other Causes. 6 to 60.	Other Causes. Over 60.
31st December '96	—	1	—	—	1	—
7th January '97	—	—	—	—	1	—
14th " "	—	—	—	—	—	—
21st " "	—	—	—	—	2	—
28th " "	—	—	—	—	—	3
4th February "	—	—	—	—	—	—
11th " "	—	—	—	—	—	—
18th " "	—	—	—	2	4	1
25th " "	—	1	—	2	—	1
4th March "	1	1	—	2	5	1
11th " "	2	29	—	2	8	—
18th " "	2	15	—	1	5	1
25th " "	1	14	1	4	8	3
1st April "	—	27	—	1	10	1
8th " "	—	30	2	—	9	1
15th " "	—	23	1	3	8	—
22nd " "	1	20	—	—	4	—
29th " "	—	23	1	1	2	—
6th May "	—	23	—	1	6	1
13th " "	—	5	—	1	4	1
20th " "	—	8	—	3	6	—
27th " "	—	4	—	2	6	1
3rd June "	—	1	—	1	2	—
10th " "	—	1	—	—	2	1
17th " "	—	—	—	1	1	1
24th " "	—	—	—	—	—	—
1st July "	—	—	—	2	1	1
8th " "	1	—	—	2	5	—
15th " "	—	1	—	2	2	—
22nd " "	—	—	—	—	2	—
29th " "	—	—	—	2	—	1
5th August "	—	1	—	3	3	—
12th " "	—	1	—	4	2	2
19th " "	—	1	—	3	5	2
26th " "	1	1	—	3	12	1
2nd Sept. "	—	2	—	—	6	2
9th " "	—	—	—	4	6	3
16th " "	—	—	—	2	5	2
23rd " "	—	7	—	2	11	4
30th " "	—	6	—	5	16	2
7th October "	—	1	—	3	24	3
14th " "	—	2	—	3	11	2
21st " "	—	5	—	2	11	—
28th " "	—	5	—	1	8	1
5th Nov. "	—	1	—	7	18	—
Total -	9	260	5	77	243	42
Grand Total -	274			362		
	Grand total from all causes - 636					

APPENDIX M.

GANDEVI.

GROSS MORTALITY from PLAGUE and all other CAUSES per WEEK from 28.1.98 (Date of First Case, Second Epidemic).

Week ending	Plague. Up to 5.	Plague. 6 to 60.	Plague. Over 60.	All other Causes. Up to 5.	All other Causes. 6 to 60.	All other Causes. Over 60.
3rd February 1898	—	2	—	—	5	2
10th " "	—	—	—	—	1	—
17th " "	—	—	—	1	8	2
24th " "	—	—	—	1	1	3
3rd March "	—	2	—	—	5	1
10th " "	—	—	—	—	5	1
17th " "	—	2	—	2	7	1
24th " "	—	—	—	2	4	1
31st " "	—	—	—	1	3	2
7th April "	—	1	—	2	2	1
Total -	—	7	—	9	41	—
	Grand total from all causes - 71					

Mr. D. H. Mehta.

4 Feb. 1899.

APPENDIX N.*

GANDEVI.

GROSS MORTALITY from all other CAUSES in INOCULATED and UNINOCULATED after Introduction of INOCULATION (*i.e.* 19.4.98).

Months.	Inoculated.	Uninoculated.
April 1898	—	6
May "	—	7
June "	—	12
July "	2	13
August "	0	17
September "	—	5
October "	—	14
November "	—	11
December "	1	16
January 1899 (up to 15th)	1	15
Total	4	116

14,962. With regard to the Appendix N., what was the total mortality among the inoculated and uninoculated in a village in which you had no plague?—16. That is 9·5 per mille among the inoculated, and about 18 per mille among the uninoculated.

14,963. The difference is not so great here as in the others?—No.

14,964. It is less than half?—Yes.

14,965. And it is the only village where there has been no plague?—No plague after inoculation.

14,966. Does it not strike you as rather peculiar that in the village in which there has been no plague there should be the least difference in the mortality from other causes?—Yes. One of these died from accident; he fell into a well. It is striking, of course, that the number is less here than in the other cases. (Note by witness on correcting proof of his evidence:—Please see remarks under Appendix F. of my further report and paragraph 25 of the same).†

14,967. Now, with regard to Bajwa?—The first case occurred on 22nd January 1898, and inoculation was begun on 18th February 1898. The last occurred on 3rd April 1898. The population is as follows:—

Up to 5 years	102
From 6 to 60 years	504
Over 60 years	3
Total	609

The gross mortality for three months previous to the onset of the disease was as follows:—

Months.	No. of Deaths.
From 22.10.97 to 21.11.97	4
" 22.11.97 " 21.12.97	1
" 22.12.97 " 21. 1.98	3
Total	8

14,968. Will you put in Appendices O. and P.?—Yes, as follows:—

* For this witness desires to substitute App. F. in his further report, printed as App. No. LII. in this Volume.

† *See* App. No. LII. in this Volume.

APPENDIX O.

BAJWA.

STATEMENT of GROSS MORTALITY from PLAGUE and all other CAUSES per WEEK from 22.1.98. (Date of First Case).

Week ending	Plague. Up to 5 Years.	Plague. 6 to 60.	Plague. Over 60.	All other Causes. Up to 5 Years.	All other Causes. 6 to 60.	All other Causes. Over 60.	Remarks.
1898.							
29th January	—	2	—	—	1	—	For purposes of convenience the first week is lengthened.
5th February	—	1	—	—	—	—	
12th "	—	—	—	1	2	—	
19th "	—	2	—	—	1	—	
26th "	—	3	—	1	—	—	
5th March	—	12	—	—	—	—	
12th "	—	6	—	—	—	—	
19th "	1	4	1	—	—	—	
26th "	—	2	—	—	—	—	
1st April	—	3	—	—	—	—	
8th "	—	1	—	—	—	—	
Total	1	36	1	2	4	—	

APPENDIX P.

BAJWA.

WEEKLY GROSS MORTALITY from PLAGUE in INOCULATED and UNINOCULATED after 18.2.98 (Introduction of Inoculation).

Week ending	Inoculated. Up to 5.	Inoculated. 6 to 60.	Inoculated. Over 60.	Uninoculated. Up to 5.	Uninoculated. 6 to 60.	Uninoculated. Over.
1898.						
26th February	—	—	—	—	3	—
5th March	—	—	—	—	12	—
12th "	—	3	—	—	3	—
19th "	—	1	—	1	3	1
26th "	—	—	—	—	2	—
2nd April	—	—	—	—	3	—
9th "	—	—	—	—	1	—
Total	—	4	—	1	27	1

14,969. Will you kindly add to your report the number of those who died from other causes among the uninoculated?—Yes. (Note by witness on correcting proof of his evidence:—This information is supplied in Appendix E. of my further report,† of which please also see paragraph 22).

14,970. Will you put in your table of castes?—Yes, as follows:—

TABLE of CASTES.

Castes.	Inoculated.	Uninoculated.
Barias	70	271
Valunds	2	18
Sutars	1	1
Pattidars	23	60
Brahmans	3	3
Lohars	1	19
Musalmans	1	9
Dhers	55	26
Total	156	407

14,971. The proportion of inoculated to uninoculated varies considerably in the different castes?—Yes.

14,972. Now, with regard to the other villages of the State, I think you have some information to give us?—Yes. Besides the above, inoculations were performed in several other villages of the State. The results arrived at in the Baroda district are shown in Appendix Q.

14,973. Will you put in Appendix Q.?—Yes, it is as follows:—

APPENDIX Q.

BARODA and BARODA DISTRICT VILLAGES.

No.	Name of City or Village.	Population.	Persons Inoculated.	First Date of Inoculation.	Plague Cases amongst the Uninoculated after Inoculation.		Plague Cases amongst the Inoculated.		Remarks.
				1898.	Cases.	Deaths.	Cases.	Deaths.	
1	Baroda City -	112,471	2,725*	15th Jan. -	1,499	1,216	—	—	* Include jail inoculations.
2	Savali - -	6,551	16	13th April -	465	316	4	2	36 cases, 31 deaths last year; 429 cases, 285 deaths this year.
3	Jarod - -	2,137	80	9th March -	24	16	2	2	
4	Kantharia -	364	223	24th Feb. -	4	4	2	2	
5	Jetalpur -	1,414	9	3rd March -	4	3	—	—	
6	Karodya -	718	11	21st April -	—	—	—	—	22 cases, and 13 deaths before inoculation.
7	Chhani -	4,000	87	8th April -	125	92	—	—	27 cases, 19 deaths last year; 98 cases, 73 deaths this year.
8	Karjan - -	1,893	9	23rd Feb. -	—	—	—	—	1 imported case occurred before inoculation.
9	Sakarda -	1,929	140	17th April -	26	24	—	—	12 cases, 10 deaths last year; 14 cases, 14 deaths this year.
10	Ratanpur -	268	18	12th April -	—	—	—	—	71 cases and 55 deaths before inoculation.
	Total - -	131,745	3,318		2,047	1,671	8	6	

N.B.—Undhera, Bajwa, and Koili treated separately are also villages of the Baroda district. These figures are supplied to me from the Baroda District Magistrate's office, and from the office of the Chief Medical Officer.

14,974. Taking Baroda City first, that includes jail inoculations?—Yes.

14,975. How many?—579.

14,976. Is the jail a likely place for plague?—There was no case of plague there, or anywhere near it.

14,977. Was there a case among the warders?—Not that I am aware of. In certain villages in the Naosari district inoculations were performed after the disappearance of plague, just as in Gandevi. No indigenous cases have occurred in them since. Thus the theory advanced by the opponents of inoculation that the persons inoculated are a source of danger to their uninoculated relatives, falls to the ground. Of course it is not intended to allege thereby that the disease did not break out again, because of the inoculations. The villages are shown in Appendix R., which I put in as follows:—

APPENDIX R.

NAOSARI DISTRICT VILLAGES.

No.	Name of Village.	Total Population.	No. of Persons Inoculated.	Plague Cases before Inoculation.		Rates of Attacks per 1,000 Population.	Case Mortality per Cent.	Remarks.
				Cases.	Deaths.			
1	Gadat - -	990	252	71	48	71·7	67·6	Besides these, 15 other inoculations were performed in persons living in 12 other villages.
2	Manickpur -	619	29	10	10	16·1	100·0	
3	Sonvadi - -	1,272	24	—	—	—	—	
4	Valoti - -	746	96	5	4	6·7	80·0	
5	Ajrai - -	465	69	7	5	15·0	71·4	Last case on 18.10.97.
6	Dhanoori - -	1,081	99	3	3	2·7	100·0	A case and a death each on 7.7.97 and 10.7.97.
7	Naosari - -	16,276	8	36	28	2·2	77·7	All imported cases.
	Total - -	21,449	587	132	98	6·24	73·8	

N.B.—Billimora, Dhamdachha, and Gandevi treated separately also belong to Naosari District. The figures about cases and deaths and population were supplied from the Chief Medical Officer's office. Those about the inoculated were obtained personally from the register at Billimora.

Mr. D. H. Mehta.

4 Feb. 1899.

14,978. In none of those villages did you have any cases since inoculation?—That is so.

14,979. In Appendix S. you give the villages and towns in the Kadi district?—Yes, as follows:—

APPENDIX S.

KADI DISTRICT VILLAGES.

No.	Name of Villages.	Population.	No. of Persons Inoculated.	Plague in Uninoculated after Inoculation.		Plague in Inoculated Persons.		Rate of Attacks per 1,000 Population.	Case Mortality per Cent.
				Cases.	Deaths.	Cases.	Deaths.		
1	Kholwada	945	114	2	—	—	—	2·1	—
2	Metrana	1,033	8	5	2	—	—	4·8	40
3	Pachakvada	966	40	1	1	—	—	1·0	100
4	Methan	915	43	1	1	—	—	1·0	100
5	Dindrol	1,019	25	4	1	—	—	3·9	25
6	Bhilwan	638	37	7	3	—	—	10·9	42·8
7	Sidhpur	16,224	95	38	38	—	—	2·3	100
8	Vaghdod	2,116	15	—	—	—	—	—	—
	Total	23,856	377	58	46	—	—	2·4	79·3

N.B.—These figures were supplied to me from the Chief Medical Officer's office.

14,980. There have been no deaths among the inoculated from plague?—That is so.

14,981. Can you, in each of these villages, give us the total number of deaths from other causes among the inoculated and uninoculated persons?—I will do that. (Note by witness on correcting proof of his evidence:—Appendices G. to K. of my further report* relate to the Naosari District, regarding which please also see paragraphs 55 to 66 of the report; Appendices L. to Q. are for the Kadi District, in connection with which please also see paragraphs 67 to 80 of the report; information about the Baroda District is not available, but such information as could be got about Sakarda, Kantharia, Jarod, and Savali is given in paragraphs 28 to 54 of my further report).

14,982. Now we come to Baroda?—Yes. The population is as follows:—

Under five years	11,160
5 to 60	94,368
Over 60	6,943
Total	112,471

Dr. Chitnis got this statement for me. I do not know how he prepared it. The gross mortality for three months previous to the appearance of plague was as follows:—

	Under 5 years.	6 to 60.	Over 60.
January 1897	38	78	33
February "	37	78	33
March "	70	96	38
Total	145	252	109

14,983. Will you put in Appendix T.?—Yes, as follows:—

APPENDIX T.

BARODA.

GROSS MORTALITY from PLAGUE and all other CAUSES WEEK by WEEK from the FIRST CASE in BARODA (*i.e.*, 4.4.97).

Week ending	Plague.	All other Causes.
10th April 1897	4	55
17th " "	2	77
24th " "	1	53
1st May "	—	46
8th " "	—	56
15th " "	—	47
22nd " "	—	71
29th " "	—	66
5th June "	—	103
12th " "	—	116
19th " "	—	57
26th " "	—	77
3rd July 1897	—	69
10th " "	—	57
17th " "	—	56
24th " "	—	58
31st " "	—	69
7th August "	—	86
14th " "	—	80
21st " "	—	94
28th " "	—	84
4th Sept. "	—	79
11th " "	—	82
18th " "	—	81
25th Sept. "	—	92
2nd Oct. "	—	103
7th " "	—	103
14th " "	3	107
21st " "	1	103
28th " "	1	111
4th Nov. "	—	110
11th " "	1	137
18th " "	6	90
25th " "	5	133
2nd Dec. "	5	144
9th " "	3	143
16th " "	9	140
23rd " "	28	166
30th " "	24	191
6th Jan. 1898	45	127
13th " "	43	190
20th " "	78	202
27th " "	79	240
3rd Feb. "	105	269
10th " "	92	268
17th " "	112	222
24th " "	156	152
3rd March "	168	225
10th " "	117	186
17th " "	65	119
24th " "	50	80
31st " "	48	60
7th April "	20	76
14th " "	10	74
21st " "	2	44
28th " "	4	61
5th May "	—	52
13th " "	—	46
20th " "	—	28
27th " "	1	33
3rd June "	—	57
10th " "	—	52
17th " "	—	57
24th " "	—	38
1st July "	—	39
8th " "	—	37
15th " "	—	47
22nd " "	—	60
29th " "	—	67
5th Aug. "	—	60
12th " "	—	70
19th " "	1	68
26th " "	1	81
2nd Sept. "	—	37
9th " "	—	55
16th " "	1	76
23rd " "	—	50

* See App. No. LII. in this Volume.

Week ending	Plague.	All other Causes.
30th Sept. 1898	—	66
7th Oct. „	—	77
14th „ „	7	64
21st „ „	1	72
28th „ „	3	72
4th Nov. „	—	89
11th „ „	3	79
18th „ „	2	69
25th „ „	3	82
2nd Dec. „	3	92
9th „ „	3	81
16th „ „	8	74
23rd „ „	2	96
30th „ „	14	75
6th Jan. 1899	12	120
14th „ „	20	153
21st „ „	35	135
Total	1,407	8,893

N.B.—These figures are supplied by Dr. G. C. Chitnis from records in the Sanitary Commissioner's Office. Detailed information as to age could not be had.

14,984. How do you account for the enormous rise of the mortality there from other causes?—I suppose many cases of plague must have escaped detection.

14,985. Is that not a fact very favourable to the beneficial effects of Haffkine's prophylactic fluid?—Yes, because no case of plague occurred among the inoculated.

14,986. Do you put in Appendix U.?—Yes, as follows:—

APPENDIX U.

Baroda.

Gross Mortality from Plague among the Inoculated and Non-inoculated Week by Week after the Introduction of Inoculation in Baroda (*i.e.*, 15th January 1898).

Week ending	Inoculated.	Uninoculated.
20th Jan. 1898	—	78
27th „ „	—	79
3rd Feb. „	—	105
10th „ „	—	92
17th „ „	—	112
24th „ „	—	156
3rd March „	—	168
10th „ „	—	117
17th „ „	—	65
24th „ „	—	50
31st „ „	—	48
7th April „	—	20
14th „ „	—	10
21st „ „	—	2
28th „ „	—	4
5th May „	—	—
13th „ „	—	—
20th „ „	—	—
27th „ „	—	1
3rd June „	—	—
10th „ „	—	—
17th „ „	—	—
24th „ „	—	—
1st July „	—	—
8th „ „	—	—
15th „ „	—	—
22nd „ „	—	—
29th „ „	—	—
5th Aug. „	—	—
12th „ „	—	—
19th „ „	—	1
26th „ „	—	1
2nd Sept. „	—	—
9th „ „	—	—
16th „ „	—	1
23rd „ „	—	—
30th „ „	—	—
7th Oct. „	—	—
14th „ „	—	7
21st „ „	—	1
28th „ „	—	3
4th Nov. „	—	—
11th „ „	—	3
18th „ „	—	2
25th Nov. 1898	—	3
2nd Dec. „	—	3
9th „ „	—	3
16th „ „	—	8
23rd „ „	—	2
30th „ „	—	14
6th Jan. 1899	—	12
14th „ „	—	20
21st „ „	—	35
Total	—	1,226

N.B.—This statement was prepared by Dr. G. C. Chitnis from the records in the Sanitary Commissioner's Office. Detailed information as to age could not be had.

14,987. According to Appendix U. you have had 1,226 cases among the uninoculated and no case among the inoculated?—Yes.

14,988. Will you put in Appendices V. and W.?—Yes, as follows:—

APPENDIX V.

Baroda.

Gross Mortality from all other Causes amongst Inoculated and Non-Inoculated from Introduction of Inoculation in Baroda (*i.e.*, 15.1.1898).

Week ending.	Inoculated.	Uninoculated.
20th Jan. 1898	—	202
27th „ „	—	240
3rd Feb. „	—	269
10th „ „	—	268
17th „ „	—	222
24th „ „	—	152
3rd March „	—	225
10th „ „	—	186
17th „ „	—	119
24th „ „	—	80
31st „ „	—	60
7th April „	—	76
14th „ „	—	74
21st „ „	—	44
28th „ „	—	61
5th May „	—	52
13th „ „	—	46
20th „ „	—	28
27th „ „	—	33
3rd June „	—	57
10th „ „	—	52
17th „ „	—	57
24th „ „	—	38
1st July „	—	39
8th „ „	—	37
15th „ „	—	47
22nd „ „	—	60
29th „ „	1	66
5th August „	—	60
12th „ „	—	70
19th „ „	1	68
26th „ „	1	80
2nd Sept. „	1	36
9th „ „	—	55
16th „ „	—	76
23rd „ „	—	50
30th „ „	—	66
7th Oct. „	1	76
14th „ „	—	64
21st „ „	—	72
28th „ „	—	72
4th Nov. „	—	89
11th „ „	—	79
18th „ „	—	69
25th „ „	—	82
2nd Dec. „	—	92
9th „ „	1	80
16th „ „	—	74
23rd „ „	—	96
30th „ „	—	75
6th Jan. 1899	—	120
14th „ „	—	153
21st „ „	—	135

N.B.—This statement was prepared by Dr. G. C. Chitnis from the records in the Sanitary Commissioner's Office. Details about age could not be had.

Mr. D. H. Mehta.

4 Feb. 1899.

APPENDIX W.

BARODA.

STATEMENT showing CASTE, SOCIAL POSITION, &c., among INOCULATED and UNINOCULATED in BARODA.

Caste.	Inoculated.	Uninoculated.	Total.	Remarks.
Hindus	763	88,258	89,021	579 were prisoners. Information about 822 persons is wanting.
Muhammadans	453	19,815	20,268	
Europeans and Christians	50	259	309	
Parsees	43	363	406	
Jains	15	2,452	2,467	
Total	1,324	111,147	112,471	

Social Position.	Inoculated.	Uninoculated.	Total.	Remarks.
Servants	465	38,536	39,001	579 were prisoners. Information about 822 is not available.
Labourers	46	14,473	14,518	
Merchants	208	4,090	4,298	
Beggars	1	5,959	5,960	
Students, persons doing household duties, &c.	604	48,090	48,694	
Total	1,324	111,147	112,471	

N.B.—This statement was furnished by Dr. G. C. Chitnis.

14,989. There were six deaths among the inoculated?—Yes.

14,990. How many inoculated people were there?—I think we should exclude the jail people, because they do not come into this.

14,991. Why should you exclude them?—I do not know whether the deaths among the prisoners have been counted.

14,992. Then we will count the prisoners in one calculation and not in the other?—If we count the jail inoculations also it is 2·2 per mille per annum; excluding them it is 2·7.

14,993. Is not that a remarkably small mortality?—Yes.

14,994. How do you account for that?—I cannot give any explanation.

14,995. You are of opinion that on the whole inoculation does not produce any ill effects worth mentioning?—Yes, if you look to the general mortality from other causes. (Note by witness on correcting proof of his evidence:—Please see Appendices T., U., V., and W. of my further report*, and paragraphs 86, 87, and 92 to 96 of the same). Even supposing all the persons mentioned above got the different ailments from the effects of the operation the number is very small compared to the saving in life from plague effected by the same.

14,996. Have you seen two attacks of plague in the same person?—No.

14,997. Have you any clinical evidence as to plague in inoculated persons?—Yes, as a rule the cases which recover are milder. (Note by witness on correcting proof of his evidence:—Please see paragraph about "Clinical History of Cases in the Inoculated" in my further report*). The temperature does not rise higher than 103 in most cases, and if it does it goes down soon. In these cases, moreover, delirium is rarely seen. At most there is drowsiness. I have only seen one case in which there was high delirium and aphasia. I had given up hopes at one time, but he came round. The case mortality is much less. I should like to say also that 60 per cent. of multiple buboes cases recovered.

14,998. How many cases were there?—Three out of five recovered.

14,999. Is there anything else you would like to mention?—I have prepared special tables, in which I have put down all the villages in which inoculations were done, and in which cases occurred after inoculation.

15,000. A special table?—Yes, two; I will put them in. (Note by witness on correcting proof of his evidence:—Please see Appendices R. and S. of my further report,* and paragraphs 81 to 85 of the same).

15,001. (*Mr. Cumine*) Taking Billimora first, did you keep a register of the names of those who were inoculated?—Yes.

15,002. How did you know whether a person who was attacked or who had died was inoculated or uninoculated?—We used to give certificates to those who were inoculated.

15,003. Were you at Billimora yourself?—Yes. We used to give certificates, and used to know the people whom I had inoculated. We made a point of asking whether a man was inoculated or not. In fact, they themselves would bring the matter to our notice, saying "Here are persons who were attacked after inoculation, "although you said they would not be attacked."

15,004. If nobody came forward and said that the person attacked had been inoculated, did you presume that he was uninoculated?—No. We used to inquire whether he was inoculated or not from the other members of his family, and we used to look him up in our register.

15,005. With regard to each person attacked and each person who died?—Yes. We first inquired whether the man attacked was inoculated or not, and when the inquiry was made in the beginning there was no necessity for any further inquiry.

15,006. I suppose with regard to some people you did not hear of their being attacked until they were dead?—Yes.

15,007. Did you make inquiries in the case of everybody who died without your having heard that he had been attacked?—Yes.

15,008. How did you ascertain in such a case whether the dead person was inoculated or uninoculated?—By referring to the register and personal knowledge also.

15,009. (*Dr. Ruffer.*) Are the registers kept in the native language or in English?—English.

15,010. Can we see them?—They are at Billimora, but I think there must be a copy here, also giving those for the whole State.

15,011. (*The President.*) Are they accessible? Could you procure them for us?—Yes. I think you could have them.

15,012. (*Mr. Cumine.*) In Billimora did you actually make out the register of inoculated persons?—I inoculated most of them myself.

15,013. Who actually wrote in the register the names of the persons?—My Hospital Assistant.

15,014. As they were being inoculated?—No, afterwards, on the same day after operation. We had to send a report also to the Chief Medical Officer every day.

15,015. Had you any register of the names of all the uninoculated people in the town?—There were registers prepared.

15,016. Had you the register personally?—No, there was a special Revenue Officer for them.

15,017. When an uninoculated person was attacked or died was any entry made in the register of uninoculated persons to that effect?—I believe in most cases that was done.

15,018. Do you know that?—Yes.

15,019. Where is that register?—I think it must be at Billimora.

15,020. According to the census taken on the 19th of last month the total population was 5,350?—Yes.

15,021. When did you begin inoculation at Billimora?—5th April 1898.

15,022. Did you complete inoculation in one day?—No, the inoculations were continued till the 19th September.

15,023. Are these figures which you give in Table I. of your précis for persons inoculated and uninoculated taken from your registers?—No, from the special

* *See* App No. LII. in the Volume.

census as regards the uninoculated, and from the inoculation register as regards the inoculated.

15,024. The special census from which these figures of uninoculated persons are taken was taken about eight or nine months after inoculation began, was it not?—Yes. (Note by witness on correcting proof of his evidence:—To make this clearer I have prepared an amended statement which gives much more approximate figures of the two classes as they stood at the beginning of the inoculations. *See* paragraphs 1 and 2 of my further report.)*

15,025. And some three or four months after inoculation ended?—Yes.

15,026. Do the figures of uninoculated persons in this abstract for Billimora agree with the register of uninoculated persons which you tell us the Awalkarkun kept?—Generally they will agree.

15,027. Will they agree exactly?—Not exactly. That is why I say the figures are approximate.

15,028. If inoculation went on gradually for four or five months the numbers of inoculated and uninoculated must have been constantly changing?—Yes.

15,029. Are the persons whom you show in your abstract for Billimora, as being uninoculated, persons who finally remained uninoculated in September when the inoculations ended?—Yes.

15,030. Throughout the time the inoculation was going on, the total number of uninoculated must have been large?—Yes.

15,031. So that if a percentage is to be calculated on the uninoculated, and you take as the uninoculated merely those who remained uninoculated at the end of the inoculations, the result must be a fallacious one, must it not?—Most of the inoculations were at the beginning, and therefore it would not necessarily be fallacious. Very few were done later on. (Note by witness on correcting proof of his evidence:—Please see Appendix A 1 of my further report* which gives the number of inoculations per week.)

15,032. Who went round to make this special census?—The different clerks.

15,033. Had they in their hands the register of inoculated persons which your Hospital Assistant had prepared?—No.

15,034. Then how did they know who were inoculated and who were uninoculated?—I had a register of those whom I had inoculated, and also the total population, taken. From the latter we deduct 432 (the number of inoculated), and that gives the number of uninoculated persons in the town.

15,035. When the census was taken by the Vabivatdar did he find out how many of the people still alive were inoculated, and how many uninoculated?—No.

15,036. Has no one gone round with your register to see by the actual inspection of the people how many people in your inoculation register were still alive?—No; no one specially took the register round, but we knew that only 16 died of plague.

15,037. Who made out the investigation sheets of Billimora?—Most of them were made out by me.

15,038. Did you go personally into the houses and inquire?—Yes.

15,039. The inoculations ended in September last; has anybody ever gone round to see, as regards every individual one of the inoculated persons, whether he is still alive or not?—No.

15,040. With regard to these investigation sheets, I understand you to say you did not go round personally to certain houses?—Yes.

15,041. When you prepared the investigation sheets did you make actual inquiry at the houses concerned, as to whether certain persons had been attacked or certain persons had died?—The sheets were prepared on the very day the attacks occurred. Whenever an unnoted death occurred in a particular inoculated house (*i.e.*, without our knowledge of the attack), whether among inoculated or uninoculated, we prepared the sheets on the same day.

15,042. You did not go round afterwards?—No.

15,043. You did not actually go to the houses?—No (*i.e.*, not afterwards).

15,044. Did you not go to the houses afterwards at any rate?—Not always, but if another case occurred in the same house we went.

15,045. So to this extent you did make a personal test?—Yes.

15,046. Is it only to this extent that the attacks and deaths among the inoculated and uninoculated persons have been actually tested by an inquiry at the house?—Yes.

15,047. In these sole instances where the attacks and deaths among inoculated and uninoculated persons have been tested by actual inquiry at the houses it turns out that fewer people were attacked among the inoculated than among the non-inoculated?—Yes.

15,048. With regard to Koili, who made out the investigation sheets there?—I believe Dr. Diwanjee did so.

15,049. You give in your first table for Koili the figures for the inoculated and uninoculated persons, with the attacks and deaths among them?—Yes.

15,050. Does the Table No. II. embody the only test which has been applied by house-to-house visitation to the figures given in your Table No. 1?—For these figures another test was applied. In the census list remarks were made against the names of certain persons who had died of plague. Remarks were entered also against the names of those who had been inoculated. From this register we found out how many deaths had occurred in those families in which inoculations were performed.

15,051. But did you go round to every house in the town and find out regarding every inoculated person whether he was alive or not?—No.

15,052. Did you go round to certain houses and find out whether the inhabitants were alive or not?—I did not go round myself. Probably Mr. Diwanjee, who was in charge there, did. These investigation sheets were prepared when the cases occurred amongst the inoculated or uninoculated in those houses in which inoculated persons were living.

15,053. Were they prepared by going to the house?—I suppose so.

15,054. They represent the test applied to the figures in your first table, by going to houses and making inquiries on the spot?—That is with regard to the second table (given at page 2 of the abstract). We formed the first table from the special census. (Note.—The following extract from the précis of evidence is given to indicate what the witness meant, viz.):—

KOILI.

I.

Persons inoculated.	Persons not inoculated.	Attacks.		Deaths.		Percentage of Attacks.		Percentage of Deaths.	
		Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
1,159	2,162	13	123	9	110	1·1	5·6	0·7	5·08

These figures show the good effect of the serum as a protective.

From the synopsis of investigation sheets also the results are favourable.

II.

Inoculated.	Uninoculated.	Attacks.		Deaths.		Percentage of Attacks.		Percentage of Case Mortality.	
		Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
48	73	13	18	9	17	27·08	24·6	69·2	94·

* *See* App. No. LII. in this Volume.

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15,055. (*The President.*) You made no personal observations?—No, not I myself.

15,056. (*Mr. Cumine.*) Assuming this synopsis of investigation sheets is the only test applied to your first abstract for Koili, it would appear that when the percentage of attacks amongst the inoculated is tested by house-to-house visitation it springs up from 1 per cent. to 27 per cent.?—The first is on the total population and the other is only in relation to the population of those houses in which inoculated persons were living and in which either inoculated or uninoculated persons were attacked. The two tables are quite different. One shows the attacks and deaths in the total inoculated and uninoculated population of the whole town, the other gives the same information as regards inoculated houses only.

15,057. At Koili the special census was taken, I think, about four months before inoculation began?—At the beginning of the epidemic, not quite four months, because inoculation was begun on the 22nd of February 1898. The first case occurred on the 8th January 1898. That means about a month and a half.

15,058. How long did the operations go on?—The last operations were done by M. Haffkine on the 5th of April 1898.

15,059. When were the greater part of the operations performed?—On the 5th April (over 700 operations).

15,060. You say that no death is reported to have occurred from other causes among the inoculated?—Yes. We sent for the death registers, and we found nobody had died among the inoculated from other causes.

15,061. Was any special census taken of Gandevi?—I remember being told by the Vahivatdar that the figures were supplied from a special census taken.

15,062. (*Dr. Ruffer.*) Will you kindly tell me whether the people in Billimora, both inoculated and uninoculated, were turned out of the town?—No, the whole town was never evacuated.

15,063. Did you give any special advantages to people who had been inoculated?—Yes.

15,064. In what way?—Their sick were allowed to be kept in a house at the end of the street generally, and to be treated by themselves. The other persons in the house were not turned out of the house for 10 days if they were inoculated.

15,065. Were they allowed to leave the town on passes?—Periodical passes were issued for two months; the inoculated persons could go all over the Taluka.

15,066. The uninoculated had no passes?—That is so. They had to take a special pass for one day, and they were only given passes if there were no infection in the house or street in which they lived.

15,067. How many inoculated people obtained passes in order to get away?—Most of them. In fact, we made it a rule to give a pass to the people who were inoculated at the time the inoculation certificates were given.

15,068. Do you think most of them went away?—They went out and came back. There was no restriction as regards their movements. They never went away and stayed at other places, but they were allowed to move about, *i.e.*, for business mostly.

15,069. Whereas the uninoculated were not allowed to go out of the town?—That is so.

15,070. Was that the same in Undhera?—I cannot tell you.

15,071. Was it the same in Dhamdachha?—Yes, they were given passes to go out. That was one of the inducements offered them to get themselves inoculated.

15,072. Did most of them come back?—Yes.

15,073. I suppose it was the same in all the villages?—In the Naosari district.

15,074. Can you give us a statement in all these places as to how many inoculated people left the town and how many came back in each district?—I will give you that. (Note by witness on correcting proof of his evidence:—This information is not available; *see* paragraphs 88 to 91 of my further report.)*

* *See* App. No. LII. in this Volume.

15,075. (*The President.*) After you had performed an inoculation, was each inoculated person kept under observation? Do you know if that person has remained in Baroda or not?—No special observation was kept.

15,076. You do not know whether the inoculated persons remained in Baroda or not?—No.

15,077. Who actually makes the observations with regard to the inoculated and uninoculated persons, as to whether they are dead or living?—Different persons in the different villages. In Baroda Dr. Chitnis did it personally.

15,078. And in the other villages?—Dr. Diwanjee did it in Undhera.

15,079. Are any of these gentlemen here?—Dr. Chitnis is here. At Billimora I made inquiries, because I was there.

15,080. I thought you said it was generally done by a subordinate?—When I was told an inoculated person was attacked I went to the house and made inquiries. I prepared the investigation sheets myself in most cases.

15,081. And in the other cases?—I think Dr. Chitnis was there in one or two cases, and my Hospital Assistant in three or four cases when I was on leave.

15,082. The inoculated persons were allowed to stay in the villages after they were evacuated?—They were not made to evacuate their houses.

15,083. You had cases in which inoculated persons took plague?—Yes.

15,084. Were they allowed to remain in the village?—Those that were attacked were kept in a house at the end of the street. They were not taken to the Government Hospital unless they willed it themselves.

15,085. Before you discovered cases in a village the persons remained in their own houses?—Yes.

15,086. They, therefore, might become foci of infection or re-infection in that village, because they remained in the village when the others went out?—Yes.

15,087. According to your figures inoculation has greatly reduced the mortality rate, apart from plague?—Yes, in most places.

15,088. Have you made any observations to show if inoculation has any effect upon malaria?—No special inquiries were made.

15,089. Have you made any?—I know of the case which I have put down in my précis, of a man who was suffering from malarial fever having got no attack after inoculation.

15,090. What are the prevalent diseases in this district?—After the monsoon, generally, fever prevails, and dysentery during the monsoon.

15,091. Anything else?—Nothing particular.

15,092. Have you made any observations with regard to the effect of inoculation upon dysentery?—No.

15,093. You say in your précis that you had observed on one occasion that a patient had aphasia?—Yes.

15,094. Was that shortly or a long time before death?—He recovered.

15,095. Was the aphasia early or late in the illness?—I think it came on the third or fourth day.

15,096. Did you frequently observe weakness in the voice of plague patients?—Yes, thick speech.

15,097. Did they ever lose their voice?—I know of only two cases where the voice was lost.

15,098. What was the tests by which you knew this man had aphasia?—I can say he tried to speak and was not able to speak at all.

15,099. Could he write?—I never tried that experiment.

15,100. He tried to speak but could not make sounds?—Yes.

15,101. He could not articulate?—No.

15,102. Why do you think it is aphasia and not aphonia?—It might be aphonia.

(Witness withdrew.)

Mr. K. B. JADHAV called and examined.

15,103. (*The President.*) What is your official position?—I am a District Magistrate.

15,104. And in connection with plague what have you to do?—I had to organise the whole of the plague measures.

15,105. (*Mr. Cumine.*) In what district?—I was in Naosari.

15,106. I suppose you tried the ordinary measures of isolating the sick people and segregating the contacts?—Yes.

15,107. And evacuating infected localities?—Yes.

15,108. What was the effect of attempting to get hold of the contacts? Was the result good? Did you get contacts generally?—Yes.

15,109. When you turned a village out did you disinfect the clothes of the people as they went out?—In certain portions. For instance, in Gandevi, we did that; all the people were turned out of each muhalla and their bodies were anointed with carbolic oil, and then they were washed with hot water and soap, and allowed to go to their temporary sheds. All their vessels were put in a bonfire.

15,110. How did you manage to keep the people out of the infected sites?—We had a regular police guard at the entrance of the town.

15,111. If a case occurred in a hut did you find it spread to the other people in the hut?—In the cold weather it did spread a little, especially among those people who had not been disinfected.

15,112. Did you notice any decrease in virulence towards the end of the epidemic?—Yes, always.

15,113. In what way?—People used to live longer, and the cases were not so frequently fatal as in beginning of the epidemic.

15,114. Have you noticed any case where indigenous plague has resulted from an imported bubonic case?—I do not think I can tell you exactly of a case, but we had instances where a sick person came to a house, and after his death two or three other persons died.

15,115. What are the measures of the usefulness of which the people are so convinced that they will themselves be ready to adopt them should the plague break out again?—Evacuation is the only measure.

15,116. Are the people convinced of its usefulness?—Yes. In fact, now we do not find any difficulty in evacuating them; we simply tell them and they go out.

15,117. Do they understand the danger of going back to the infected village site?—They do not exactly understand that. They think it is bad, but they do not mind going.

15,118. Do they think there is any danger in the clothes of an infected person?—I do not think they believe in that.

15,119. Have you any cases of villages which were infected last year and in which plague has appeared again this year, apparently without any fresh infection?—Yes, Dhamdachha; in the first epidemic cases occurred there. The infection was carried there from Gandevi, and the next year, and all of sudden, cases began to appear in the cold season. We could not trace the infection to any other place, so we thought it was a recrudescence.

15,120. In what month and among what people was the first epidemic?—It was towards the end of March, among the Kolis and Pattidars. It appeared again at the end of the monsoon among the Kolis; also, the first case was amongst the Kolis.

15,121. Was there any other infected village near, when the second epidemic began?—Yes; there were two or three British villages near, but we could not trace the infection to those places.

15,122. After the cases in March, did you disinfect all the houses in the village with perchloride of mercury?—I cannot say we disinfected them thoroughly. A certain quantity of perchloride of mercury was used, but an attempt was made rather to clean the houses of dirt, and expose them to the rays of the sun. Finally, just for the sake of appearance, they were all whitewashed in a way.

15,123. Have you noticed any instances of people being attacked twice by plague?—I remember one instance at Dhamdachha. The wife of the Patel of that place was attacked again at the end of about a year.

15,124. Have you been able by evacuation to stop plague very frequently?—Yes, within a week after clearing out the whole people.

15,125. Which do you think is the largest village in which you can, by evacuation, stop the plague within a week?—I can show you parts of a village where within four, five, or eight days, the plague was stopped completely by evacution.

15,126. You could not stop plague, for instance, in Bombay by evacuation?— No. Gandevi has a population of 8,000, and, I think, a population like that could be treated by evacuation.

15,127. Could you stop the plague within a week in it?—Within a week or ten days.

15,128. You put then about 8,000 as the limit of population among whom you could stop the plague in a week or ten days by evacuation?—I do not see why we should not be able to do it on a larger scale; for instance, in a town like Baroda, I would evacuate the whole place if there was plague, and within a fortnight it would be stopped. When the whole town of Gandevi was evacuated, the disease was stopped.

15,129. In what month was that?—I think the people were evacuated in the month of March.

15,130. When plague appears in a town, and the people run away from it, what do you think it is they run away from—the plague, or fear of the measures which are going to be adopted?—I think they are more afraid of the plague officers than of the plague itself.

15,131. Do you think that if nothing at all was done in a town the people would not run away, although the plague became very bad?—They would run away of their own accord.

15,132. Because of the plague?—Yes. They would not run away all of a sudden, but would take their time. They would make their own arrangements, and then run away.

15,133. (*Dr. Ruffer*). With regard to the woman who had plague twice, can you tell us when the first attack of plague was?—As far as my memory goes, 350 days before the second attack took place.

15,134. How do you happen to know that?—Because I was on the spot at the time.

15,135. Where was the bubo in the first attack?—In the right groin.

15,136. Who diagnosed the case as one of plague?—The Hospital Assistant of the place.

15,137. Had the husband got plague?—No.

15,138. Had anybody else in that house got plague?—I think two or three other people died of plague.

15,139. The second attack was 350 days afterwards?—Yes.

15,140. Where was the bubo then?—I did not examine it, because the woman was in a very dangerous condition; she was on the point of death.

15,141. Did she die?—Yes, I think she died in about two or three hours.

15,142. There is no doubt about that case being one of plague?—No doubt.

15,143. You said just now you thought you could evacuate a village of 10,000 people: we had it in evidence yesterday that in one village in which 10,000 people were turned out, 6,000 people escaped into the neighbouring villages. Do you think that would be the rule?—If proper arrangements were made by taking the people into one's confidence, I do not think there would be any necessity for the people to go away.

15,144. Not as many as 6,000?—No.

15,145. Do you think a good many would escape?—No. I had to deal with a population of 8,000 people, and very few of them ran away.

15,146. Why did they run away in Ankleshwar?—They were afraid more of the arrangements there, and there was no accommodation in the monsoons.

15,147. You think the weather had something to do with it?—Yes. In the monsoons we cannot take proper steps on account of the want of accommodation.

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15,148. So that for about four months in the year you could not apply evacuation?—Not unless we had buildings for that purpose.

15,149. (*The President.*) What do you think are the factors which are most likely to increase plague in any area after its introduction?—Bad sanitation is the first thing that can increase it, and also if no isolation is practised.

15,150. It may be prevented by isolation, but what would increase it if the increase were due to bad sanitation?—I think in that case almost all the people attacked would die.

15,151. What do you mean by bad sanitation?—Very bad water, and damp in the houses; all filth, and no conservancy arrangements.

15,152. It is from your experience that you say this?—Yes, that is from my experience.

15,153. Have you found sanitation to be bad in many instances?—Yes. We had one locality in Gandevi, which was in our Territory, and where we could not take any steps in the beginning, and the mortality there was very high.

15,154. Since you have had plague in those places, you have attended to the sanitation?—Yes, the town is now in very good sanitary condition.

15,155. How did it happen that sanitation had not been attended to before plague occurred?—Because the people did not understand its importance before, and no one took any interest in it.

15,156. You have now been carrying on extensive improvements: in what directions have these been chiefly carried out?—In opening the streets, widening the roads, by house-to-house conservancy, and by better water supply in the shape of wells. Formerly tanks were the means of water supply, but now we have wells in addition.

15,157. Have you done anything to improve the construction of houses?—Yes. Where there was no ventilation, we have made new windows, and allowed plenty of light and air to get in.

15,158. You have made a very remarkable change in this district with regard to sanitation?—Yes; two or three towns are now put in very good sanitary condition.

15,159. What is the probability of this improvement in sanitation being continued after plague has disappeared?—I think that the Government now, as well as the people, understand that they cannot be negligent very long with regard to sanitation, and they will keep it up I hope.

15,160. Have you found that these improvements in sanitation, which have been so marked, have cost much money?—To me it has not cost much, because I had the people to work with me. In India, if you get the people to work with you, with a little persuasion, and a little firmness, they can do much more than the Government can with a lot of money.

15,161. It is possible to do a great deal without a heavy expenditure?—Yes.

15,162. The change has been very great?—Yes.

15,163. How do the people like the change?—They seem to like it very much.

15,164. They seem to like openings being made in their houses for light and ventilation?—Yes, all except the Machis; these people cannot bear a great deal of light in their houses.

15,165. They have some superstition with regard to light?—It is not that, but they think that their property is not safe if they keep them open, and they turn their houses into a regular box.

15,166. But on the whole you think the people greatly appreciate the improvements, and would be willing to pay for their continuance?—When a question of payment occurs, they will say no. It is only when the Government says they must pay, that they will do so; and unless the Government show that it is an absolute necessity they will not do it.

15,167. I understand you to say that you have not encountered any difficulty in accomplishing evacuation—No difficulty.

15,168. With regard to the people who have been evacuated, they liked the change after it had been accomplished?—Yes, they enjoyed their camp life very much, and when they were asked to go back to the town they said they would rather remain.

15,169. Is there a general improvement in the health of the people living in camps?—I have marked a great change. The general mortality is very low, and the general health very good. The mortality this year is extremely low.

15,170. Have you any observations that seem to show that plague may be carried by clothing?—Yes. There is a place called Dave Mola. When that locality was evacuated at the end of March, three boxes of clothes and other kit were taken to a house in Anawala Mola. After about a fortnight dead rats were found in that house, and two or three people died of plague.

15,171. Is there any other means that you know of, by which plague could be introduced, other than by clothing?—Yes, by the moving about of rats I believe; but I cannot exactly point out the house from which the rats went. The general impression is that when dead rats are found, plague increases.

15,172. In the instance of infection by clothing, which you referred to, I understood you to say that rats only appeared afterwards?—Yes, after.

15,173. Do you think they had anything to do with this case of infection?—No.

15,174. You think there was no other cause of infection?—No, I think it was a clear instance.

15,175. Have you seen many cases of pneumonic plague?—In the beginning we had mostly bubonic; after the bubonic, we had what the doctors call the pneumonic form.

15,176. You then found the mortality different?—Yes, in the pneumonic type of cases, the people died in large numbers.

15,177. I understand you to say that, in your opinion, the best measure to adopt in treating an outbreak of plague is evacuation?—Yes, that is the only one.

15,178. In reference to disinfection, to what extent do you think it can be effectively carried out?—With regard to disinfection, I do not believe that you can disinfect a house thoroughly—and Indian houses especially. The best thing, if it is very bad, is to burn it down if you can.

15,179. What have you to say about disinfection by chemical substances?—I do not think there is much to say about it.

15,180. Because of the construction of the houses?—Yes, and the difficulty of applying it.

15,181. What is the difficulty?—The difficulty is that you cannot reach each hole and corner; I might say the construction generally speaking.

15,182. (*Mr. Cumine.*) Have you any instance of the spread of plague from pneumonic cases?—In the village of Gangaur in the month of June 1887, when we were thinking we were free from plague after it was stamped out of Gondevi, Billimora and Dhamdachha, a report came that a few persons died suddenly in one house in this village. At that time plague cases were recognised more from the appearance of buboes. The pneumonic type was not commonly known. The Medical Officer on the spot could not definitely give his opinion in the absence of a *post-mortem* examination. To be on the safer side, I requested H.E. The Dewan Sahib to send Dr. K. V. Dhurandhar to visit the place. He accordingly saw the place and pronounced that the deaths were due to pneumonic plague. The first person who died was an old man of 75. The type was most infectious. Most of them who attended his funeral (and they were not only of Gangaur but of other villages too, for the old man was an influential man) got affected and died. Information was collected, and it was found that on account of this one old man, 37 lives were cut short, of which 13 were his own relatives. The house in which this old man died was stinking so much that within 40 feet of his room one could not walk with comfort.

15,183. (*Dr. Ruffer.*) Can you tell me which of these cases were pneumonic, and which bubonic?—I cannot tell you.

15,184. You think there were bubonic cases?—Yes.

15,185. Were there any pneumonic cases?—There were both bubonic and pneumonic, but I cannot tell you the exact number.

15,186. (*The President.*) I think you can give us some information about the period of incubation, can you

not?—Yes, I think it is about 10 days commonly; in rare cases it is 15 days, and in very rare cases about a month and a quarter.

15,187. Can you give us some instances in which it has been a month and a quarter?—A ghorawala of a Parsee was attacked with plague on the 10th of February. He had come from Bombay about a month and a quarter previously; and he had a bubo. He recovered after staying in hospital for about a week. There was also another similar case of a man in Naosari, which came to my notice. Fifteen days was not a common period, but within ten days was very common.

15,188. You investigated these cases within a month of their occurrence?—Yes, we made all inquiries.

15,189. (*Mr. Cumine.*) Were not a great many refugees from plague-stricken districts coming into Billimora at that time?—At that time they were not coming in, but some had come. In that locality none had come. Gaolis and Mochis had come from Bulsar, but this case happened in a Parsee locality, and there were no cases.

(Witness withdrew.)

RAO BAHADUR K. V. DHURANDHAR called and examined.

15,190. (*The President.*) You are Sanitary Commissioner and Secretary for plague operations in Baroda?—Yes.

15,191. You have had the advising and guiding of plague operations in the State?—Yes, from 1896 up to the present day.

15,192. Your experience has been increased by your having had a mild attack of plague yourself?—Yes, in May last, but it was very slight.

15,193. Will you give us a description of the habits and dwellings of the people in this Territory?—The people for the most part are strict vegetarians. The higher class Hindus and the cultivators are total abstainers; the others drink moderately. Use of opium is common in Kathiawar and Northern Gujarat. The dwellings of ordinary people are of poor description. They are damp, ill-ventilated and constructed without regard to sanitary precautions. The population being mostly agricultural, houses and huts are crowded together in small areas. People and cattle dwell under the same roof, and the soil is saturated with human and animal excreta. The pollution of soil, air, and water is common. My opinion is that plague was introduced by human agency, and carried from place to place by sick persons and their belongings. Some animals—as rats, monkeys and squirrels—are also carriers of plague infection. The disease is intensified manyfold if it once establishes itself in a filthy place. Dirt and deficiency of ventilation and light increase the virulence of the poison to an enormous degree. If introduced in clean surroundings the bacillus of plague is almost powerless to do mischief. In every plague-stricken place or locality I visited, domestic misery and filth were common concomitants. Under hygienic conditions the attacks from plague are extremely few.

15,194. How was plague imported into this Territory?—Most of the cases were received from Bombay by the railway at the commencement.

15,195. You had anticipated the danger?—Yes, and we were preparing ourselves after the first report that we heard about plague being in Bombay. It was a new thing to us all, so I went myself to Bombay, and I saw what was being done. On my return, I advised certain restrictions to be put upon the railway stations, and certain precautions to be taken in case of plague appearing.

15,196. When was the first case introduced?—It was introduced first of all in Naosari on the 1st of October, 1896.

15,197. Could you tell us what towns were attacked, and also the order in which they were attacked?—Naosari was not attacked, and it has been protected even till now. The first imported case we got in Baroda City was on the 10th of March, 1897. This was from Surat.

15,198. Would you tell us the others?—Another case was imported in Kadi town in Northern Gujarat on the 1st of November, 1896, in Amreli town on the 18th of December, 1896, and in Beyt in Okhamandal, Kathiawar on the 21st of May, 1897. In most of the places I visited, I very often noticed that there was first an imported case. This was followed by detection of dead rats before an indigenous case was noticed. The danger of the spread of plague from place to place by persons infected with the disease was found to be very great. Proper precautions to restrict the movements of persons from place to place helped, no doubt, to minimise the evil, but the absolute stopping of the infected fugitives was an impossibility. Plague germs may be carried with foodstuffs; but there is no danger of their being introduced into the human system along with food which is generally cooked. One generally finds cracks and fissures on the hands and soles of persons in this part of the country, through which the germs can get an easy access. Clothes of the poor are generally not very clean, and therefore are likely to carry plague infection in them.

15,199. After being imported, how do you think plague extended; what are the circumstances of its extension?—There are the insanitary conditions to account for it, and my experience was that after an imported case occurred some time elapsed—perhaps a week or a fortnight—and then dead rats were found in most of the places. After the dead rats most of the indigenous cases occurred.

15,200. By what substances do you think the plague germs can be carried?—By human agency mostly. There are, of course, the probabilities of its being carried by clothing and other means, but except in one case at Ahmedabad, I have no definite facts to show that it was imported by clothing or other articles.

15,201. You say you have one case?—Not in our Territory, but at Ahmedabad; I happened to be there.

15,202. Would you describe that case?—Yes. Three persons from Bombay, in whose house there was a plague death, escaped to go to their native country in Kadi. They came by rail as far as Ahmedabad, and put up at the house of a relative. They remained there for three days, leaving behind a bundle of clothes. Then they left the railway route and went by the land route to their native place Kadi. On the third day after their leaving, indigenous cases occurred in Ahmedabad in the room in which they had put up for three days. The Ahmedabad people telegraphed to me to say that such and such people had come from Bombay. They had, in the meantime, investigated into the whole of the cases, and again they telegraphed to me to say that "certain people belonging to your "Territory had come down here, and remained for three "days, and given infection to the people where they "lived, and have gone to Kadi. Will you please let us "know whether they are attacked, or whether they "are living or dead?" I went to Ahmedabad and made the necessary inquiries, took down their names, and telegraphed to the executive authorities at Kadi to make inquiries. These people were found there, and kept under observation for ten days, and they were all right.

15,203. Although the persons themselves did not have plague, nevertheless they gave the plague to people who came in contact with them?—They gave the plague to their relatives in Ahmedabad, and two cases occurred.

15,204. Did they leave their clothes?—Yes, they left a bundle of clothes, and that leads me to suppose that in that case infection was carried by clothing.

15,205. You said it may be carried also by rats. Do you know of any other animals carrying it?—I saw some cases in monkeys and squirrels. I packed the animals to be sent for bacteriological examination, but I am sorry to say the parcel miscarried, owing to the negligence of the sepoy to whom it was entrusted.

15,206. Have you had any experience of Haffkine's fluid?—I was, as Secretary, supervising all plague arrangements, and I have seen all these operations being performed, but since there was a separate gentleman appointed to deal with that, I do not go into the details. I have got my own impressions about it.

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15,207. Did you have cases occurring in inoculated persons?—Yes.

15,208. Within what time after inoculation?—Professor Haffkine told me that all cases which occurred within ten days of inoculation might be safely excluded as having taken the infection previously, but I have got nine cases to show that the period of immunity offered by the prophylactic is uncertain, cases having occurred after nine or ten days, a month, and two months.

15,209. Could you give us those cases?—Yes, they are as follows:—

	Date of Inoculation.	Date of Attack.
1.	28th May 1898	27th June 1898.
2.	26th „ „	30th „ „
3.	26th „ „	3rd July „
4.	28th „ „	21st „ „
5.	24th July „	28th „ „
6.	2nd May „	31st „ „
7.	2nd „ „	3rd August „
8.	24th July „	7th „ „
9.	2nd May „	7th „ „

15,210. The difficulties of proving the good effects of inoculation are considerable, are they not?—Very considerable.

15,211. What do you consider are the main difficulties?—I found, taking the whole population, the probabilities of attacks are three per thousand, while taking the infected areas where the epidemic is raging, the probability of infection is not more than ten per thousand; the rest may be said to escape.

15,212. So that a great many of those who escaped infection might have been inoculated?—Yes.

15,213. You have a table showing the ratio of plague deaths per thousand of population in the several districts of your State?—Yes.

15,214. Would you put that table in?—Yes. The table is as follows:—

BARODA DIVISION.

No.	Name of Place in which indigenous Cases occurred.	Ratio of Mortality per Mille of Population.	Remarks.
1	Baroda	11·4	
2	Ratanpur	175·3	
3	Undhera	84·7	
4	Bajwa	52·5	
5	Kantharia	41·2	
6	Sankarda	26·9	
7	Koila	26·8	
8	Wasna	23·5	
9	Jarod	20·6	
10	Bhaniara	17·2	
11	Chhani	15·5	
12	Savali	7·9	
13	Padra	2·2	
14	Chandod	13·3	
	The whole Division	1·01	

15,215. What was the total population?—A little over 25 lakhs for the whole State.

15,216. How many of them were attacked with plague between October 1896 and June 1898?—I have a statement made up to the end of January 1898, but for different divisions. The total is 5,894 attacks, and 4,396 deaths for the whole State.

15,217. You have a table showing the total number of persons attacked which gives a ratio of 1½ per thousand of population?—Yes.

15,218. You have also a tabulated statement showing the number of cases according to sex and caste?—Yes.

15,219. Will you also put that statement in?—Yes, it is as follows:—

PLAGUE CASES according to SEX.*

No.	Place or District.	Males.	Females.	Unknown.	Total.	Proportions of Males to Females.	Remarks.
1.	2.	3.	4.	5.	6.	7.	8.
1	Baroda City	910	710	1	1,621	1 to ·78	
2	Baroda Division	397	393	54	844	1 to ·099	
3	Naosari	445	338	—	781	1 to ·78	
4	Amreli	22	20	1	43	1 to ·90	
5	Kadi	223	229	19	471	1 to 1·2	
	Total	1,995	1,690	75	3,760		

* From 1st October 1896 to 30 June 1898.

The following table shows the number of plague cases in the State according to caste*:—

No.	Place or District.	Hindus.					Muhammedans.	Parsees.	Jains.	Christians.	Others.	Total.	Remarks.
		Brahmans.	Banniahs.	Marathas.	Other Castes.	Total.							
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1	Baroda City	271	141	325	723	1,460	160	—	—	—	1	1,621	
2	Baroda Division	43	94	1	617	755	34	—	—	1	54	844	
3	Naosari	139	61	19	427	646	81	44	10	—	—	781	
4	Amreli	9	—	—	25	34	8	—	—	—	1	43	
5	Kadi	11	10	—	285	306	146	—	—	—	19	471	
	Total	473	306	345	2,077	3,201	429	44	10	1	75	3,760	

The ratio of the number of attacks to each mille of the population in the several divisions of the State, and in the city of Baroda was as follows* :—

No. 1.	Place or District. 2.	Total Population. 3.	Total No. of Attacks. 4.	Ratio of Attacks to Mille of Population. 5.	Remarks. 6.
1	Baroda City -	112,471	1,621	1·46	
2	Baroda Division	704,552	844	1·80	
3	Naosari - -	319,443	781	2·45	
4	Amreli - -	180,188	43	2·12	
5	Kadi - -	1,098,742	471	0·41	
	Total -		3,760		

* From 1st October 1896 to 30th June 1898.

15,220. In regard to the measures that were adopted, what do you consider are the most efficient?—The best of all measures is evacuation.

15,221. Do you mean by that, total, or partial evacuation?—Total evacuation would be the best; I would certainly recommend total evacuation of infected quarters.

15,222. What is the importance, after an epidemic has started, of sanitary measures?—It is very doubtful.

15,223. It is too late then?—I believe that the time for taking sanitary precautions has gone when the epidemic has once established itself, and I believe that at times it is even dangerous to be too enthusiastic, and disturb old deposits.

15,224. You have said that you consider it most important to have early notification of cases?—Yes.

15,225. What means did you adopt to obtain early information?—I insisted on all the executive officers having a census of all the places taken, and particularly of the infected areas and their surroundings. That forms the best basis for all plague operations.

15,226. You took a census in the first place?—Yes.

15,227. Did you verify it from time to time?—Yes.

15,228. How often?—At the infected places we had clerks to verify it almost every day.

15,229. What is your opinion in regard to disinfection?—Disinfection is very doubtful, because it is a scientific experiment, and unless done by competent persons, and with all manner of precautions, throwing a pailful of it here and there, just as it is done at present, I do not believe it is of very great use.

15,230. At the same time you have sufficient faith in it to adopt it after evacuation?—Yes.

15,231. You have inquired carefully into the meteorological conditions existing during plague?—Yes, I made an attempt to do so, thinking I could get something out of it, but I do not think there is much in it.

15,232. What was the result of your inquiry?—I have here the meteorological conditions existing at the time the epidemic lasted.

15,233. You have several charts* which show the attacks and deaths from plague?—Yes. There is one chart I have prepared specially, in order to call your attention to the evacuation.

15,234. Will you tell us about that?—It is the statement "Showing the influence of camping out people on "total weekly mortality during the epidemic of plague "in Baroda city." We commenced camping out on the 23rd of January, 1898. You will see that the numbers are given for each week. The first week it was 374, and the second week 360. Before that some people had left of their own accord—a large number. We found that the mortality began to decrease after camping out, to the 12th of February, when we had a storm, and our camping arrangements were all upset. The people ran back to their houses in a mass, and almost from the second day the mortality commenced to increase again from plague. For one week we were almost paralysed, because the ground was so wet that we could not erect huts. But we took it up again on the 20th of February, and since then we progressed very well, and brought down the mortality almost to normal in five weeks.

* Not published with the Proceedings of the Commission.

15,235. That showed that camping out was very beneficial?—Very beneficial.

15,236. The benefit caused by camping out might be entirely destroyed if the people went back prematurely?—Yes.

15,237. And the benefit might be recovered if the people were again sent into camp?—Yes.

15,238. Is there any other point which you wish specially to mention?—I have compiled a statement showing the average daily humidity and the maximum and minimum temperature for all the months during which the plague lasted in the city of Baroda. Its results are summarised as follows:—

—	Oct. '97.	Nov. '97.	Dec. '97.	Jan. '98.	Feb. '98.	Mar. '98.	Apr. '98.
Humidity - -	72	55	58	55	67	59	60
Max. Temperature -	94	103	96	89	85	97·5	105
Min. Temperature -	66	53	49	47·5	54·5	59	70
Total Mortality - -	477	591	725	1330	1330	685	251
Plague Mortality -	5	17	69	301	490	352	36
Plague Attacks - -	6	20	111	383	634	419	38

It is not very conclusive, but it shows that plague poison flourished best when all these conditions were moderate—not excessively high or excessively low.

15,239. When they are at their mean?—Almost exactly at their mean.

15,240. In regard to that, at the same period is it not likely that people would be crowding into their houses?—People generally crowd into their houses during the winter time, when the winter is severe—by a severe winter I mean when our minimum temperature goes down to about 40 Fahrenheit.

15,241. That is the cold weather?—That is the coldest weather we have here. At that time, generally, the people crowd into their houses.

15,242. Have you found that plague is worst at that period?—Yes; you can say that it was worse at that period because it flourished during the early cold season.

15,243. Therefore it might not have been the cold, but the crowding into the houses?—Yes, that might be so.

15,244. You have made some observations as to the relation between the occurrence of plague, and the direction of the wind? Will you state them?—It was generally an easterly wind. I do not know whether that is the condition most favourable to the spread of it, but when the plague raged most, there was decidedly an easterly component, the wind varied north to east. As it assumed a westerly component, and a decidedly westerly component, it disappeared. These facts are to be taken for what they are worth, as they are only for one place, and one time.

15,245. With regard to the north and north-easterly winds, do they occur chiefly in the hot or cold season?—Chiefly in the cold season.

15,246. At that time they crowd into their houses?—Yes.

15,247. (*Dr. Ruffer.*) With reference to the statement showing the effects of evacuation, will you tell us what was the total population of Baroda at the time of the evacuation?—It was reduced very nearly to three-fourths. Some people had fled away, and some people had camped out of their own accord. You will see that there is an asterisk put on the day of the storm.

15,248. How many people came back to the city?—The whole lot of them on the day of the storm.

15,249. You do not think any of them escaped?—No, because all these people who had come down into the huts got soaked, and before evening they all rushed back to their houses in the city.

15,250. When the town was evacuated, I suppose there was a roll-call of the inhabitants of the camp?—Yes, we had a roll-call.

15,251. Was there a roll-call when they came back?—No, we used our former census and house registers again.

15,252. Have you any evidence to show that people escaped during that time—that they went from this

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evacuation camp to other villages round about?—No, I can say almost positively that they did not go, because I was on the scene, and I saw them coming from the camp, and rushing into the town.

15,253. You could not count them every day?—No.

15,254. How did you know that they did not go to other villages?—Because the people were not allowed to do so.

15,255. How are you sure that they did not break through and go to other villages?—Because there were no reports. If they had escaped to the surrounding villages, we would have got reports.

15,256. Who would have reported them?—There was a sort of a cordon for each surrounding village, and no man was allowed to go into them without a pass from the plague authority in Baroda.

15,257. How many soldiers had you on that cordon?—It was not a military cordon.

15,258. What kind of cordon was it?—A cordon of the village officials and servants.

15,259. Had you a cordon round the evacuation camp?—The muster roll was taken in the evacuation camps every day. Besides there were sepoys to watch people going out and in.

(Witness withdrew.)

Mr. R. N. Jadhav.

Mr. R. N. JADHAV called and examined.

15,260. (*The President.*) You are a Licentiate of Medicine and Surgery, of Bombay?—Yes.

15,261. And you are the Medical Officer at the Government Hospital of this town?—Yes.

15,262. It is a Plague Hospital, I understand?—Yes.

15,263. When was this hospital opened as a Plague Hospital?—In the month of April 1897, but regular plague cases were admitted since the month of October. The first case was admitted on the 6th of October.

15,264. It is still open?—Yes. It is still open.

15,265. How many cases have been treated there?—In the last epidemic, I treated 476 cases.

15,266. What were the results of treatment?—Out of of 476 patients treated, 342 died, and 134 recovered, the mortality rate being 71 85 p. c. of the total cases. 143 died within the first 24 hours of admission and 79 during the next 24 hours, so that, nearly ⅔ of the total mortality occurred during 48 hours of admission. Looking to the figures of hospital mortality furnished in the different months during which the epidemic prevailed, it was clear that the epidemic gained in intensity from October onwards, till the end of January 1898, when it reached its acme. The type was undoubtedly virulent during those months, as could be judged from the smaller percentage of recoveries, but during the months following, there was a steady decline and the recoveries proportionately more.

15,267. Would you tell me what the mortality has been?—The mortality has been 71·85 per cent.—the case mortality.

15,268. Have you excluded those who died within 24, or 48 hours?—No; if you exclude those who died within the first 24 hours, the mortality is still further brought down to 59·76.

15,269. What types of plague have you had under treatment?—Chiefly bubonic.

15,270. What other types?—Pneumonic, septicæmic, and one without either pneumonia or buboes.

15,271. How does that differ from what you term the septic type?—In the septicæmic type there are several lymph glands on the body involved, not only one, but the glands are diffused all over the body.

15,272. It is a bubonic type with a large number of glands affected?—Yes, and it is more fatal than the bubonic itself.

15,273. Which was the most fatal form?—The most fatal was one without buboes (non-bubonic).

15,274. That would be a septicæmic type?—No. It is a type characterised by pneumonic engorgement of the lungs, and accompanied by extreme prostration of vital powers.

15,275. What was the result of your observations as to the channels of entrance of infection?—I have not formed a precise opinion about it. It must be either a breach of the skin, or through the medium of respiration. We had a servant who was chiefly engaged in washing and dressing buboes. That man had cracks on his hand. I believe he got plague probably through the pus of infected buboes.

15,276. Was there any change produced by the virus on the hand?—No there was nothing.

15,277. Where was the bubo in that case?—In the left axilla.

15,278. You have inquired into the origin of the several cases which you have had under treatment?—Yes, I have inquired.

15,279. Have you heard of any bubonic cases which appeared to originate from pneumonic cases?—I do not know of any such cases.

15,280. Reversing that, do you know of any pneumonic cases which appeared to originate from bubonic cases?—No. (NOTE.—On correcting the proof of his statement witness noted that cases of both the varieties referred to in the preceding questions had come under his observation, and on being asked to supply particulars sent the following statement with a letter dated the 21st March 1899:—"What I meant by cases of inter-"changeable type, or rather a mixed type, which, as I "noted in the copy of my evidence returned to you, "came under my observation during the present "epidemic, was this: that cases were observed in "which symptoms of pneumonia were conspicuous at "the time of admission, but after some interval buboes "were found to develop in the same patients. In the "same way, some cases were of a distinct bubonic type "to start with, but as time passed on pneumonia de-"veloped in them. This is what I understood from "the query of the President. Now, according to the "wording of to-day's telegram, if you want the details "of cases of pneumonic type giving rise to bubonic and "*vice versâ*, I am afraid I shall not be able to furnish "you with the required information by to-day's post. "I am looking into the hospital records for cases of "such a description, and should I come across any I "shall be happy to forward the same to you (half-"a-dozen cases of each type.") On March 25th, the witness accordingly sent the following notes:—

DETAILS of PNEUMONIC CASES arising from BUBONIC.

1. *Dwarka Trimbuck*, child, aged 8 years. Admitted on 20.1.99 for pneumonia. Right lung chiefly affected. Temp. 100°–105°. Resp. 30–50. Sputum watery, tinged with blood. Contact with her mother, who died of bubonic plague (left axillary gland) in this hospital on 23.1.99. The patient has recovered and is discharged.

2. *Anna Baba*, male, aged 24 years. Admitted on 8.3.99, and kept under observation, as he was suffering from fever. A week later symptoms of pneumonia developed. Temp. 99°–103°. Resp. 25–50. Sputum rusty, cough troublesome. Contact with his brother, who was attacked with bubonic plague on the 6th March 1899, and who is still a patient in this hospital under treatment with right cervical chain of glands affected.

3. *Gungi Girdhas*, female, aged 35 years. Admitted on 23.2.99 for pneumonia in a semi-conscious state; speechless. Temp. 100°–103°. Resp. 30–38. Cough troublesome with dyspnœa. Right lung affected. Voice husky. Contact with her son, who is said to have died of fever and bubo at her house about a week before her removal to the hospital; she being all the time in the segregation camp where no infection was possible. The patient has recovered and has been discharged.

4. *Navi Motilal*, female, aged 36 years. Admitted on 18.3.99 for pneumonia in a delirious condition. Temp. 103°–104·6°. Resp. 28–38. Both lungs affected. Cough frequent and troublesome, accompanied by characteristic frothy watery expectoration tinged with blood. Extreme prostration. Contact with her husband and son, both of whom died of bubonic plague in the hospital during the last week. Patient still under treatment.

5. *Lukshimbai Keela*, female, aged 40 years. Admitted on 2.3.92 for pneumonia. Both lungs affected; semi-conscious. Temp. 102·4°. Resp. 48. Sputum watery

and reddish. Cough slight. Sank very fast and died within almost 24 hours of admission. Contact with her daughter-in-law, who died of bubonic plague in this hospital on 26.2.99.

6. *Eshwar Bhugwan*, male, aged 34 years. Admitted on 10.3.99 for pneumonia, in a delirious condition. Temp. 100°–104°. Resp. 36–48. Cough and dyspnœa. Sputum watery and tinged with blood. Contact with his brother, who died of bubonic plague in the hospital on 11.3.99. His brother Kashidas, who died of bubonic plague in this hospital, was living with the patient in the same house and was attacked with fever and bubo five days before the patient was affected with pneumonia. Both were removed to hospital together from the same house. The patient died within 28 hours of admission.

DETAILS of BUBONIC CASES arising from CONTACT with PNEUMONIA.

1. *Mansukha Raghu*, male, aged 30 years. Admitted on 24.1.99 for fever and bubo in left inguinal region. Contact with Chhagan Madhao, who was living with him in the same house and who was treated for pneumonia in this hospital. Chhagan became ill a week before the patient was attacked and both were removed to the hospital on the same day and from the same house. The patient is now a convalescent.

2. *Ichha Chotalal*, female, aged 33 years. Admitted on 23.2.99 for fever and bubo in the left axilla. Contact with her husband who was treated in this hospital for pneumonia. The patient has recovered and has been discharged from the hospital.

3. *Krishnabai Satwajee*, child, aged 8 years. Admitted on 23.2.99 for fever and bubo in the left inguinal region. Contact with a patient who was living in the same house with her and who was treated for pneumonia in this hospital. The patient is now in a convalescent state.

4. *Gunga Girdhar*, female, aged 30 years. Admitted on 8.3.99 for fever and bubo in the left groin. Contact with her brother-in-law, who died of pneumonia in this hospital. Patient convalescent.

5. *Mangal Chotu*, male, aged 13 years. Admitted on 7.3.99 for fever and bubo in right groin. Contact with his sister, who is reported to have died of pneumonia in the house whence he was brought within 24 hours of attack. The sister is said to have died 8 days prior to the removal of the patient to hospital. The patient is a convalescent.

6. *Dwarkabai Pandoba*, female, aged 30 years. Admitted on 7.3.99 for fever and right cervical bubo. Contact with her son, aged 5 years, who is reported to have died of pneumonia at her house about a week before her removal to the hospital. The boy is said to have died of pneumonia within about 30 hours of the attack).

15,281. What do you think is the chief factor in hospital treatment which is beneficial?—I think in hospital the patients are isolated and are better cared for, and well nursed; and the case mortality is reduced more or less by hospital treatment of the above sort.

15,282. By what point mainly?—Chiefly by nursing.

15,283. You do not think that the purer air and ventilation have so much to do with it?—I do; I attach equal importance to that at the same time.

15,284. Not more than nursing?—No, not more.

15,285. They get very good nursing at home often?—No; not so well as in hospital, except in rare cases.

15,286. What is the incubation period in your experience?—From inquiries made I find it to vary between 10 to 12 days—10 to 14 at the most. There are cases of 20 days, but such cases are mere exceptions.

15,287. Could you give us the particulars of any case of 20 days' incubation?—There was a case last January where a man had a friend of his who used to attend on him and frequently visit his house. The man died at the hospital within 20 days at most. His friend came to the hospital shortly afterwards and died of plague. That man used to frequent the house where the first case occurred. He was a friend of the man who was first admitted into the hospital. That man got attacked 20 days after the death of the first man, which was the last time he saw him.

15,288. Might he not have seen other cases of plague?—This man was in a segregation camp.

15,289. Where to your knowledge there were no cases of plague occurring?—There was no plague in the segregation camp then.

15,290. Have you any other instance?—No.

15,291. Do you remember any case in which incubation appeared to be more than 10 days, excepting the one you have stated?—There are about half-a-dozen cases, and I believe there is a record of them in the hospital.

15,292. In which the incubation period appeared to be more than 10 days?—Yes.

15,293. Will you give us the details of those half-a-dozen cases?—Yes. (The following statement was added to his evidence by witness in correcting his proof:—

DETAILS of CASES in which the PERIOD of INCUBATION appeared to be more than TEN DAYS.

1. *Man Sing.*—Male, servant, aged about 45 years; attacked on the 26th December 1898. Had come in contact with a highly suspicious case that had occurred on the premises of a bungalow where he was employed during the first week of December 1898.

2. *Annappa.*—Male, aged 40 years; cook employed at the same bungalow with the above patient, in whose room he used to sleep; attacked on the 11th January 1899. Contact with the above patient only, whom he saw for the last time on the 26th of December 1898.

3. *Kalidas Gordhan.*—Child, aged 7 years, attacked on the 2nd February 1899. Contact with his mother who was attacked on the 22nd January 1899. The boy was at once taken to segregation camp after the illness of the mother.

4. *Lukshmibai.*—Female, aged 20 years; attacked on 2nd February 1899. Had come in contact with her sister, who died on the 22nd January 1899.

5. *Punji Motilal.*—Female, aged 31 years; attacked on 10th February 1899; only contact with a neighbour who died of plague on 28th January 1899.

6. *Chotalal Damodhar.*—Male, aged 60 years; attacked on 24th February 1899; only contact with a neighbour affected with plague on 10th February 1899.

7. *Shankar Madhav.*—Attacked on 28th February 1899. No history of contact with an infected person except a case that had occurred in the house in which he was living on the 28th of January 1899.

All the above cases were removed to the hospital either from the segregation camp or from the houses direct, where on careful inquiry it was found that there was no chance of the patients being infected from any other sources than those mentioned in the case of each of them.)

15,294. What do you think are the most characteristic symptoms of plague?—The peculiar expression of anxiety which is stamped on the countenance of the man, suffused condition of the eyes and the condition of the tongue, it being very parched and dry, red and clear at the tip and margins, but coated, sometimes thickly, in the centre. There is also a difference in the speech, which is thick, and the man talks as if he were under the influence of drink; there is also a difference in the gait, and he cannot walk properly. There is intense thirst, and the pulse is soft and compressible.

15,295. When a man is lying down, you trust mainly to the appearance?—I have seen some patients coming from a distance of 500 or 1,000 yards. They came attempting to walk to show that they did not feel the pain of the bubo, or anything, but there was a peculiar kind of swinging gait.

15,296. There are many cases in which you could not observe the gait; in those cases upon what do you base the diagnosis?—The condition of the tongue, the expression, and the character of the speech—it is a very thick speech—and the soft and compressible nature of the pulse.

15,297. Do you find any cases in which the articulation is impossible—where they cannot speak at all?—I did not notice it; but later, as the cases progressed, I noticed in one case that a man lost the power of speech altogether.

15,298. They generally have impaired speech?—Yes.

15,299. I understand you have examined the urine of many cases?—I have.

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15,300. What were the results you obtained?—Nearly every specimen that I tested contained albumen.

15,301. Under what test?—Under nitric acid.

15,302. That gave a clouding?—Yes.

15,303. What more did you do?—When I heated the urine it turned cloudy; with the acid the clouding did not disappear, it remained stationary.

15,304. Was there much or little albumen?—It varied from about one-sixth to one-eighth.

15,305. You have never had a plague case without albuminuria?—For the most part not. Some cases, however, did not show albumen at all—the majority of cases did.

15,306. Were they bubonic, septicæmic and pneumonic cases?—Of either one form or the other.

15,307. Did you find blood in the urine of any plague cases?—Yes. I remember one case where there was hæmaturia, and I found disintegrated corpuscles and blood casts under the microscope.

15,308. What was the result in the case of pregnant women who acquired plague?—It generally ended in miscarriage with uterine hæmorrhage and death of the patient.

15,309. In advanced or early pregnancy?—I came across cases of advanced pregnancy, and they all ended in miscarriage and death of the patients.

15,310. What are the chief symptoms on which you base your diagnosis of plague?—The condition of the tongue and the pulse chiefly. I rely more on the condition of the pulse. As soon as the speech showed any improvement, or the pulse rallied, then there was some ground for hope; and also if along with that there was a clearing of the mental condition.

15,311. The temperature was no criterion?—No criterion at all.

15,312. You found bad cases at low temperatures as well as high temperatures?—Yes, very often.

15,313. Did you use any curative serum?—No.

15,314. Do you know whether any of your patients have been inoculated with Haffkine's fluid?—No, none of those that were admitted into hospital.

15,315. What is your opinion as to the general results of medicinal treatment?—Treatment has not been quite so satisfactory. If there is anything that is of any special value, it is the stimulants—cardiac tonics and vascular stimulants.

15,316. But not specially beneficial?—Not unless combined with careful nursing.

15,317. (*Dr. Ruffer.*) I notice that you disinfected huts and patients with nitric oxide gas. What evidence have you got to show that nitric oxide gas is a disinfectant?—I do not know how far it is an efficient disinfectant. I had to use it at the direction of the Chief Medical Officer in the hospital. It was mainly used in the hospital.

(Witness withdrew.)

Mr. A. D. Cooper.

Mr. A. D. Cooper called and examined.

15,318. (*The President.*) You are Health Officer at Baroda?—Yes.

15,319. What are your medical qualifications?—Member of the Royal College of Surgeons and Diplomate of Public Health.

15,320. (*Dr. Ruffer.*) Have you any evidence to show how plague got into India?—No; there is no evidence to show how it got into India.

15,321. What do you consider are the predisposing causes of the plague?—The immediate cause, of course, is the germs.

15,322. But the predisposing causes?—They are yet to be determined.

15,323. Could you give me an account of the course of plague in Baroda?—I think the first case was imported from Surat. About a month after its importation there were some four or five indigenous cases.

15,324. What is the incubation period of plague?—The longest period is about 15 days.

15,325. You mentioned, in your précis, cases of a month?—I said a month after the first imported case.

15,326. Then, if the incubation period is 14 days, how can a case occurring one month after the first case be due to that first case?—I do not say that it is due to it, or anything of that kind.

15,327. How can you say that it came from Surat?—The first imported case came from Surat.

15,328. Where did the first indigenous case occur in the district?—Barhanpura.

15,329. How was the disease imported in Barhanpura?—That is very difficult to say; the infection must have come from the first case.

15,330. When did the first case come to Barhanpura, I mean the case from which six persons got the disease?—About March 1897, but we do not know how it came.

15,331. When was the first indigenous case?—In March.

15,332. The cases began to appear in the beginning of the cold season of 1897?—Yes.

15,333. Whilst the epidemic of 1897-8 appeared first in Barhanpura, the very place where a few indigenous cases had been detected in the beginning?—Yes.

15,334. You do not know whether this was the first epidemic?—It cannot be said definitely, because people had come from Surat.

15,335. Among what class of the people did the second epidemic break out?—Amongst the Deccanis, in the same district as the first.

15,336. What are they?—Brahmans principally; and afterwards it appeared amongst the rag-picking population.

15,337. What part did the Dhers and Mahars play in the carrying of the epidemic from place to place?—These rag-pickers had a great deal to do with it. They gather rags, and sell them again afterwards.

15,338. Have you any facts to show that the rag-pickers carried infection?—No, I have no experiments to show that.

15,339. Have you got any facts? You say that these rag-picking people carried plague. I want to know if you have any facts to show that they did?—No.

15,340. Can you trace a case to any one of these rag-pickers?—No, not a particular case.

15,341. The epidemic then continued; when did it reach its maximum?—About the end of February.

15,342. And then it began to decline?—At the beginning of March it began to decline, and it disappeared in April.

15,343. How do you think the plague is carried from place to place?—Chiefly by human agency.

15,344. Do you think it can be carried about by rats?—Certainly.

15,345. Will you give us facts showing that it is carried about by rats?—Generally the rats are seen before the infection appears in a locality.

15,346. Can you give us any facts that you have observed yourself which will show that?—Dying rats were found in Bukaravadi.

15,347. Where is that?—Just near Barhanpura, where it first appeared. Dead rats were found there before plague broke out amongst these people. That is the only instance I know.

15,348. You say in your précis of evidence that a large number of plague cases were undetected?—Yes.

15,349. How can you say then that the first case of plague occurred after the rats had come to that place if there were a lot of undetected cases?—That statement is as regards the whole of Baroda.

15,350. But is not that part of Baroda?—Yes, but not the particular locality.

15,351. If it applies to the whole, it applies to the particular locality?—Our attention was drawn to the locality by the general rise in mortality.

15,352. What I want to know is how can you say that in this case the rats brought the disease, if you say yourself there were a great many undetected cases of plague? What proof have you got that the rats brought disease to this place?—There is no positive proof.

15,353. You have in your précis of evidence a list "Showing the progress of plague from the 2nd of "January 1898 to 9th April 1898, comprising a period of fourteen weeks"?—Yes.

15,354. Will you put that table in?—Yes, it is as follows:—

Week ending.	General Mortality.					Plague Attacks.
	Plague Deaths.					
	In Hospital.	Before Removal to Hospital.	Total Plague Deaths.	Other Deaths.	Total.	
1.	2.	3.	4.	5.	6.	7.
1898.						
2nd January -	25	14	39	149	188	52
9th „ -	33	7	40	195	235	49
16th „ -	45	16	61	235	296	69
22nd „ -	45	21	66	232	298	75
29th „ -	48	22	70	276	346	110
5th February -	64	51	115	221	336	136
12th „ -	42	54	96	213	309	118
18th „ -	43	85	128	186	314	154
26th „ -	82	84	166	203	369	195
5th March -	98	43	141	127	268	162
12th „ -	54	27	81	78	159	90
19th „ -	44	20	64	66	130	67
26th „ -	21	21	42	66	108	66
2nd April -	28	11	39	56	95	39
9th „ -	—	—	—	—	—	—

15,355. You see that the rise in mortality from other causes coincides with the total plague mortality. In your opinion, what was this rise in the general mortality due to?—To the non-detection of plague cases.

15,356. Have you any facts to show any relationship between plague and particular castes? Were certain castes more affected than others; were Hindus more affected than Muhammadans?—No, it has no predilection for caste.

15,357. You say in your précis of evidence that the incidence of the disease was heaviest on the Hindus, there being 1,460 deaths; then come the Muhammadans with 160; and the Parsees had not a single attack of plague?—The Hindus comprise a lot of other sects and castes. They are all taken as Hindus apart from origin or race.

15,358. The number of the Parsees is small?—Yes, very small.

15,359. What are their habits of life?—They are better livers and do not come so much in contact with people, especially in this town.

15,360. Are there more males than females in Baroda?—I do not know.

15,361. Did more males suffer from plague than females?—More males.

15,362. Considerably more?—About 200 more.

15,363. The figures being 910 males and 710 females?—Yes.

15,364. Would you put in a table with regard to the mortality of plague according to age?—Yes; the table is as follows:—

Age.	Plague Attacks.
Up to 5 years - - -	28
From 5 to 10 years - - -	234
„ 10 to 20 „ - -	380
„ 20 to 30 „ - - -	354
„ 30 to 40 „ - -	285
„ 40 to 50 „ - - -	199
„ 50 to 60 „ - -	108
Over 60 years - - -	32

15,365. Have you ever noticed that plague reappeared in houses which had been disinfected?—Yes; in several houses.

15,366. Could you give us an instance of that?—This information is not available yet.

15,367. With regard to the disinfected houses in which cases of plague occurred afterwards, can you exclude the possibility of the patients having got the disease somewhere else?—No; that factor remains.

15,368. You say in your précis that "What it is "proposed to do, is to put before the Commission a "few observations as regards the uselessness or other-"wise of disinfection in general. As Health Officer, I "have had opportunities of noting the recurrence of "plague cases in houses which were thoroughly dis-"infected by mercury perchloride, and under my per-"sonal supervision." If people got disease somewhere else, how does your statement affect the value of disinfection as a preventive measure?—Those chances are fewer, in my opinion.

15,369. Why?—Because in that case that factor cannot be eliminated in any particular instance, if you are going to determine cases in any recurring houses. People will go out and move about.

15,370. How does that argue against disinfection?—Because that factor is not to be taken into consideration.

15,371. Why not? You have just said that disease was carried about by human agency, and now you tell us that human agency has nothing to do with it?—It is a likely way of carrying infection, there is no doubt; but so far as disinfection is concerned, I think it is due to the germs remaining in the house.

15,372. Why do you think so?—It is more likely that a person who has come in contact is not so liable to carry the disease.

15,373. How is the disease carried about? You say it is by human agency, and now you say a person is not so likely to carry it from another person?—Not so much. It is a likely mode of carrying infection, but the chances are not so great in personal contact.

15,374. How does the first case get the disease, when there is no case in the town at all?—That is evidently by importation.

15,375. Could you give us some other instances showing the uselessness of disinfection?—I am at present making a list of villages which are not disinfected, and where there has been no recrudescence of plague at all.

15,376. What is your opinion about quarantine?—It has not succeeded in stopping the plague.

15,377. Can you give us any facts bearing on that?—For instance, it was tried at Surat and Broach and Baroda.

15,378. I only want facts observed by yourself. You were not at Surat and Broach, and I want your evidence about things you have seen yourself at Baroda. Have you quarantine in Baroda?—Yes.

15,379. You think it failed because the disease was brought into the town?—Yes.

15,380. That is the only reason?—Yes.

15,381. Have you any evidence as to plague occurring in the lower animals?—Yes; three or four monkeys died of plague.

15,382. How did you ascertain that they died of plague?—Because they had enlargements, and plague was raging at the time; there were no bacteriological examinations.

15,383. Have you ever found that monkeys died before in an epidemic?—No.

15,384. Is it a fact that when a monkey is about to die, it leaves the town and goes out into the country? I do not know whether you have heard that?—I saw one monkey dying in the town long before the epidemic.

15,385. Have you heard of cats becoming infected?—No.

15,386. Or squirrels?—No.

15,387. Rats you have seen?—Yes.

15,388. Have you made any examination of Haffkine's prophylactic fluid?—With the assistance of Professor Masani I have made an examination, the result of which

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is as follows:—"Pale straw coloured liquid of varying "specific gravity, sediment white and granular. "Copious white froth on the surface appears when "shaken, rising either from the gases of decomposition "of the fluid itself, or from the air of the bottle. The "smell distinctly felt on removing the cork, which "appears to resemble the smell of decomposing organic "matter. The fluid, when left open in the bottle for a "time, shows no change of any kind whatsoever. Smell, "colour, and the deposit remain unaffected. On the "surface of the fluid there is no film formed, containing "no living organisms of any description. Reaction of "the fluid is neutral. The fluid (Nos. 2751 and 2932) "was examined microscopically several times for a "week, with varying powers of objectives."

15,389. Did you examine the same fluid several times for a week?—Yes.

15,390. How did you take the fluid out each time you examined it? What was the exact method; did you put a needle into the fluid, or how?—A pipette.

15,391. Did you sterilise it?—No, we cleaned it.

15,392. How do you know you did not introduce any bacteria yourself with an unsterilised pipette?—We found no bacteria. "In no case living organisms were "definitely detected. In fact it may be safely said "that there were no germs. No sarcinæ were seen at "any time. The white granular sediment, when "examined, showed some inorganic crystals of "triangular, polygonal and other forms. There were "seen some irregular forms showing swellings and "constrictions, which probably may be the dead forms "of germs, existing as involution forms. In some cases "there were seen united masses of granular débris, "which may be due to zooglaia forms. These imbibed "the colour when the specimen was stained with "aniline blue."

15,393. You said just now that there was a smell of putrefaction?—Yes; but I cannot account for it.

15,394. You said there were no bacteria?—No bacteria.

15,395. How do you account for the smell?—I do not know; I cannot account for it.

15,396. Did you notice a smell of carbolic acid?—We smelt a little of it.

15,397. You say there was a smell of putrefaction, but found no bacteria. What was the smell due to?—I cannot say what it was due to.

(Witness withdrew.)

Major C. J. Sarkies, I.M.S.

Major C. J. SARKIES, I.M.S., called and examined.

15,398. (*The President.*) You are the Residency Surgeon at Baroda, are you not?—Yes.

15,399. (*Dr. Ruffer.*) You have had some experience of inoculation with Haffkine's fluid, have you not?—Yes.

15,400. Can you tell us what people you inoculated?—All sorts of people, all castes, and at all ages.

15,401. Could you give us the number of people you inoculated?—From November 1897, to December 1898, there were inoculated altogether 2,048 persons out of 4,000, which is the total population of the cantonments.

15,402. How many of these people inoculated were soldiers?—There were about 330 soldiers and their families, the remainder were civilians.

15,403. How many were non-inoculated?—There were about 800 not inoculated in the regiment, including the families; and about 1,000 in the bazar.

15,404. Are these numbers approximate, or are they exact?—They are very nearly the exact numbers.

15,405. Could you give us the ages or castes of these people?—I could not tell you the different ages exactly, but they were of all ages more or less.

15,406. How did you ascertain the number of uninoculated people?—We have a register of persons in the cantonments, and we know how many people are living there, and how many were inoculated.

15,407. How did you ascertain the number of attacks among inoculated and uninoculated persons?—We keep a register of them.

15,408. Did you give any special facilities to inoculated people after inoculation?—Yes, we exempted them from segregation for one thing, and we also allowed them certain other privileges as to moving about, and that sort of thing.

15,409. After the epidemic of plague had disappeared were you able to ascertain whether all the inoculated people were actually alive; were you able to trace them all?—Most of them. Of course in the regiment they were all present.

15,410. But I mean the camp followers?—In the camp followers the majority inoculated did not leave the place at all. It served to give them confidence and keep them there.

15,411. Did a certain number go away?—Yes.

15,412. How many?—I should say about a quarter that were inoculated.

15,413. In the first place how did you do the inoculation?—Behind the arm—on the triceps.

15,414. How did you standardise the fluid?—I simply injected what was stated on the bottle, as supplied to me from the Bombay laboratory.

15,415. Did you ever have very high temperatures after inoculation?—No.

15,416. How many temperatures did you take altogether?—We only used to take temperatures of the cases that complained of being very bad.

15,417. What was the highest temperature you got?—104.

15,418. Did you get any abscesses?—No, I do not remember seeing a case of abscess.

15,419. Did you have any cases of plague within a few days of inoculation among inoculated people?—Yes, I have had a few cases within a week.

15,420. How many?—I remember three.

15,421. Could you tell us how long after inoculation the symptoms first appeared?—About six days.

15,422. Do you remember where the buboes were in those cases?—In one case there was no bubo at all. It was a septicæmic case; the buboes were internal probably, and I did not make a *post-mortem* examination. In another case the bubo was in the femoral region. The third case was one of pneumonic plague.

15,423. You have had two very severe cases within six days of inoculation?—Yes, but they were unmistakable cases of plague from the symptoms.

15,424. Could you give us the general results of your inoculation?—With regard to the beneficial effects on the civil and military population of Baroda cantonment from inoculation by Haffkine's fluid as a protection against plague, during the prevalence of plague in the place, 119 cases occurred among the uninoculated, and only 13 among the inoculated. That is only for the cantonments, and out of a total of 4000 people: that is a marked difference, as over half these people were inoculated.

15,425. Is that counting the soldiers?—Yes, that includes everybody.

15,426. What are the chances of recovery?—Among the cases occurring in the uninoculated 94 died out of 119. Among the inoculated four cases died out of 13.

15,427. Could you tell us the mortality from general causes during this period, excluding plague in inoculated and uninoculated?—In the regiment I have not had a death from any other cause for six months now.

15,428. Neither among inoculated or non-inoculated?—No.

15,429. Have you had any cases among the camp followers?—A few cases of fever, dysentery, bronchitis, &c.

15,430. Did those occur among inoculated or non-inoculated? I do not want the deaths from plague, but from other diseases. If you can give them, I

should also like to have their ages?—From August to December 1898 there were 17 deaths, as follows:—

	No.	Age.
Dysentery	1	1½ years
Pneumonia	1	50 years
Bronchitis, Acute	4	8, 12, 42, ?
Labours	2	25, 23
Burns and scalds	1	12
Old age	1	65
Remittent fever	2	2, 60
Heart disease	1	42
Still born	1	2 days
Convulsions	1	2 months
Tetanus	1	2 months
Diarrhœa	1	10 months
Total	17	

15,431. Can you give the dates on which all these cases of plague died, the dates when the inoculations were begun, and the dates on which the 129 people and the 13 people got attacked?—Yes, the required particulars regarding plague attacks and deaths are as follows:—

(a.) *Amongst Inoculated.*

Date of Attack.	Date of Death.	Date of Inoculation.	Remarks.
23 March 1898	22 August 1898	13 Mar. 1898	15 days after inoculation.
30 „ „	Recovered 4 May 1898	13 „ „	20 „ „
2 April „	Recovered 2 May 1898	13 „ „	20 „ „
3 „ „	Recovered 6 May 1898	14 „ „	20 „ „
3 „ „	Recovered 2 May 1898	13 „ „	21 „ „
*28 August „	29 August 1898	13 Feb. „	6 months and 15 days after inoculation.
12 Sept. „	14 Sept. 1898	9 Sept. „	3 days after inoculation.
22 „ „	Recovered	19 „ „	3 „ „
13 October „	Recovered	10 Oct. „	4 „ „
14 „ „	Recovered	11 „ „	3 „ „
31 „ „	Recovered	10 „ „	12 „ „
14 „ „	Recovered	11 „ „	3 „ „
5 Novem. „	8 Nov. 1898	15 „ „	21 „ „

* With this exception, all the attacks and deaths in inoculated persons were in persons inoculated under six months.

(b.) *Amongst Non-Inoculated.*

Months.	Date of Attack.	No.	Date of Death.	No.	Remarks.
February	21st	1	22nd	1	
March	15th to 31st	15	16th to 31st	13	
April	4th to 19th	7	1st to 20th	4	
May	„	7	2nd to 6th	5	
August	6th to 30th	8	7th to 29th	2	
September	1st to 30th	35	5th to 30th	29	
October	1st to 31st	37	2nd to 27th	23	
November	1st to 22nd	13	2nd to 22nd	9	
December	2nd to 14th	18	2nd to 15th	22	

15,432. Do you think inoculation is indispensable in combating plague?—I do not think it is.

15,433. Why not?—Because I have found that I can rid a body of men of plague without inoculation.

15,434. By what means?—By camping out and segregating them, disinfection and so on. In the regiment the men have not taken the inoculation at all well. They have refused to be inoculated.

15,435. (*The President.*) Is that the native regiment?—Yes. The total strength of the regiment is about 1,000, and we had 42 cases amongst them last year, and 32 deaths.

15,436. (*Dr. Ruffer.*) Was that before inoculation began?—There were very few inoculated indeed, 330 out of 1,000, most of them were done last March, and the majority of the cases occurred after inoculation operations.

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15,437. Did these deaths occur before the inoculation began?—No, after the inoculation began.

15,438. How many inoculated men?—330 men, women, and children.

15,439. How long do you think immunity lasts after inoculation?—I have had opportunities of observing this during the past 12 months, and I think that people are just as immune after six months up to 12 months, as they are under six months.

15,440. How do you judge of that?—Because I have had just as few cases in people over six months, as in those under six months.

15,441. You say in your précis of evidence that you had opportunities of observing this: have you got any cases occurring after six months in inoculated people?—Yes, in my table of attacks after inoculation, there is one case of an attack on 28th August, 1898, after inoculation on 13th February, 1898.

15,442. Why do you think young children and old persons should not be inoculated?—Because I find that old persons and young children suffer a great deal more than the young ones.

15,443. How about young children: do they suffer much?—Very young children, I think, do.

15,444. Did you exclude young children from your inoculations?—I never did any child under three or four years.

15,445. They are all among the uninoculated?—Yes.

15,446. Do young children suffer much from plague?—No, not so much.

15,447. Did you exclude also the persons who were ill or seedy in any way?—I always made a rule to examine the pulse and see that there was no fever before inoculating.

15,448. How many do you think you excluded for that reason?—Not very many, I should say about 5 per cent., but that was only temporary for a week. They were inoculated afterwards when they got better.

15,449. Have you any evidence to show that squirrels or monkeys convey plague?—I have no personal experience; I have heard of it. I found that squirrels died.

15,450. Have you no evidence to show that they died of plague?—No.

15,451. You say in your précis that human beings convey the disease chiefly through clothing and bedding. Why do you think so?—That is just an opinion that I formed.

15,452. Have you any special facts bearing on that question?—No, I have nothing very special.

15,453. Have you ever seen a case of pneumonic plague get the disease from a bubonic case?—No, I have never seen that.

15,454. Have you seen a case of plague pneumonia give rise to plague pneumonia in another patient?—Yes, it runs in a family very quickly.

15,455. Could you give us an instance?—I have had a case of a family where four people got the same thing one after the other. They were attending persons on the sick chiefly; everyone of them died.

15,456. Was there any bubonic plague in that house?—No.

15,457. Could you trace any bubonic case to these pneumonic cases?—No. I remember a case of a sepoy whom I inoculated a month before attack, a very strong healthy man. He lived in a tent close to where this family lived, and he got the same form of disease, pneumonic plague, and died of it.

15,458. He was one of those you spoke of?—Yes.

15,459. In the Baroda camp the disease first appeared, you say in your précis, in the grain market of the Sadr Bazar, and remained confined to it for over a month during which no dead rats were found in this place. After this dead rats were found and migrated to other parts of the cantonment, infecting them. By what means do you think dead rats can affect a place?—I suppose they had been in the place before. They were moving about, and probably deposited their excreta.

Major C. J. Sarkies, I.M.S.

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15,460. In this case can you exclude the possibility of the other parts of the cantonment having been infected by human beings?—We had no imported cases at all. It was, however, possible for other parts being infected by human beings.

15,461. Do you think you got hold of all the cases?—Yes, every case.

15,462. Was the cantonment cordoned; were the people absolutely kept in?—Yes, it was not strictly cordoned, but they did not go out of bounds.

15,463. Did you ever punish anyone for going out in the town?—No, and at that time I do not think there was any plague in the city either, about last August.

15,464. There must have been plague if the rats were infected?—There is no mistake about it that plague came into the grain market of the Sadr Bazar, where all the grain is sold, and it remained in that particular quarter for about a month. There were no dead rats found in the place during that month.

15,465. As to sanitary measures, you recommend evacuation and camping out, lime washing houses, and digging up the floors, removing the mud from the same, and saturating the floors with corrosive sublimate solution, also opening up roofs of houses to let in light and air, and exposure to the sun, disinfection and fumigation of bedding, and clothing also. What kind of fumigation do you recommend?—We use sulphur fumigation for clothing.

15,466. Do you think sulphur has any disinfecting action?—I do not think it has much. The great thing is to steep all clothing into a solution of corrosive sublimate.

15,467. You do not believe very much in fumigation?—No.

15,468. You also recommend the burning of all soiled and old clothing, and the segregation of infected families and their neighbours, etc. What people do you think are most likely to be attacked?—Principally the lower classes, and the Banniah caste.

15,469. Is that a low caste?—No, the Banniahs are not low caste.

15,470. Why do you think plague affects the Banniahs more than any other caste?—We have had that in evidence before. It is an extraordinary thing, but I have observed it.

15,471. Are they great travellers?—No. They are grain dealers as a rule. It may be that infected rats are attracted to these Banniah houses for the grain.

15,472. Is there anything else you would like to add to your evidence?—No, I cannot think of anything more.

15,473. (*Mr. Cumine.*) You had a register of all the people living in the cantonment camp. Whilst plague was going on was there any house-to-house visitation in the cantonments, with the register, to see to what extent the people entered in the register were actually present in the cantonments?—We had house-to-house visitations, yes. They had established wards in different parts of the bazar.

15,474. What I want to know is whether it was ascertained by house-to-house visitation whether all the people in the register were present?—They gradually left the place afterwards, but for a long time they were all there, as ascertained by the register.

15,475. You gave us a figure of uninoculated people, about 2,000 I think you said. Inasmuch as the process of inoculation must have taken some time to be performed, the figures of the uninoculated people must have been altering from time to time. Does this 2,000 represent the people left uninoculated at the end of the inoculations?—During the inoculations, the total number inoculated was 2,048 out of 4,000; that left 2,000 at the end not inoculated.

15,476. When any person was attacked or died, how was it ascertained whether he was an inoculated person or an uninoculated person?—By inquiry.

15,477. By what inquiry?—By looking at the inoculation register, and seeing if his name was there.

15,478. Was a note made in the register as to whether a person who was attacked, or who had died, was inoculated or uninoculated?—Yes.

15,479. In which register?—In the inoculation register. We always looked up to see if his name was there. If a person died we asked his people for his name, we then looked at the register and found out whether that person was inoculated or not.

15,480. In every case?—Yes, whether he died or not.

(Witness withdrew.)

Mr. R. E. Candy, I.C.S.

Mr. R. E. CANDY, I.C.S., called and examined.

15,481. (*The President.*) You are Collector of Broach?—Yes.

15,482. (*Mr. Cumine.*) I think that although Bombay and Surat and other places were so badly infected you managed to keep plague out of the Broach district for a year and half?—Yes.

15,483. Would you describe to us the means by which you obtained this success in keeping out plague?—The first thing I did was always to try and keep ahead of the plague, by watching very carefully which places were infected, and when the south was infected at Surat, I commenced my operations by keeping a guard at the railway stations, and by getting all the villagers to co-operate with me. I employed the ordinary village watchmen, and the low caste people to patrol the fields, giving them a small remuneration. I employed Abkari Inspectors also. I had small camps and patrol parties, and when the plague got bad in Baroda I carried on my operations in the same way from the Mahi river in the north down to Palez, which is a very important village. In the ordinary season it is only a village of about five or six hundred people, but in the cotton season the population rises to a total of between 2,000 or 3,000 people, with seven or eight ginning factories working. All the railway stations were watched, principally Broach. This duty was undertaken by Rao Bahadur Chunilal Venilal, C.I.E., from the first up to the present time. In this way the tendency of people to rush from infected areas into my district was stopped. They were sent back, and if they did come into Broach they were watched or kept under surveillance. Of course we had imported cases, but all those imported cases were put into hospital, and the disease was never allowed to spread. The surveillance rose at one time in the City of Broach to 400 people, who of their own free will, in accordance with orders given to them, came to the roll-call between 4 and 6 in the afternoon. They simply showed themselves that they were not ill, and they were allowed to go back to their houses, and in this way any case of plague that might exist was detected.

15,484. We had described to us, yesterday, how the plague epidemic was met in Ankleshwar. Would you tell us something about the plague in Broach? How did it get in there?—The plague got into Broach in September 1898. It really took root through some of the butchers coming from the infected area in Ankleshwar, and being secreted in the houses of the butchers in Broach. I think the first case was on the 14th of September 1898. I went and examined this case myself, and burnt down the hut in which the man lived, and then watched for a few days. As was to be anticipated, cases began to increase, and we at once caused the whole of that area, called the Khatkiwad, or the butchers' quarters, to be evacuated, and the slaughter houses which were in that area we also stopped. The people went out to a place called Bawa Raten where we had huts put up for them, and I kept them there till November, *i.e.*, till we had thoroughly disinfected Khatkiwad. We then allowed them to go back, and had the satisfaction of finding that not a single case of plague occurred in Khatkiwad afterwards. Of course plague in other parts of the town must have come from Khatkiwad. Cases spread and mortality rose very high in December. Previous to that, in the month of October, anticipating what would come to pass, I made all the arrangements, dividing the town into 17 wards, and organising the whole of the plague arrangements before plague came. I also made agreements with the managers of the mills, which are the great industry of Broach, that if they undertook their own arrangements for camps hospitals and medical attendants I would not interfere with them, merely exercising a friendly supervision, and the results have been most satisfactory. The mills are very important. The Vithal Mills have a camp of about 1,400

people and the Nerbudda mill has 800 people. They have their own huts and their own medical men, and they submit the returns to me, in the same way as I get them from the other wards. The mortality now at the end of January is about 12 deaths a day, with 6 or 7 plague deaths. The people have of their own free will gone out of the town, because this is a measure which I very much value. For instance, the Banniahs of the part of the city called Vejalpur have erected their own camps two miles out at a place called Kukurwada. The fishermen have a camp of their own on the banks of the Nerbudda. I think out of 40,000, there are 22,000 people now in the city.

15,485. (*The President.*) Not evacuated?—Yes. A great deal of the town is perfectly free from infection.

15,486. You had partial evacuation only?—Yes.

15,487. What parts have you evacuted?—The "D" Ward where the infection is.

15,488. The whole ward?—No, the main bazars are still going on just as before.

15,489. On what general principles did you evacuate a certain area?—I have made compulsory evacuation when a plague case occurs. If the patient is alive he is taken to hospital, and the inmates of the house are taken to segregation camp. Those who live near are also induced to evacuate their houses, and either go to their own camp or into my segregation camp.

15,490. The plague has been going on since September 1898, has it not?—The plague went on for about three weeks then, and then absolutely stopped. It recommenced again about the end of December.

15,491. (*Mr. Cumine.*) Did plague recommence again when these butchers returned, or had it been going on in other parts of the town whilst they were out?—There were no plague cases for a long time, from the middle of October until the end of December.

15,492. Do you generally manage to get the contacts, or do you find that they in most cases run away?—In many cases they ran away.

15,493. Do you think taking the contacts to segregation a useful measure, or does it do more harm than good?—I think it is a useful measure, only of course all plague measures are distasteful to the people. I am doing my best to make people in the segregation camp as happy as I possibly can.

15,494. Are there any measuses which you think the people are so convinced of the usefulness of, that they would adopt them of their own accord if plague came back again?—Voluntary evacuation. For instance, when plague broke out in Khatkiwad in September for some reason there was a panic, and about 10,000 people fled away from Broach suddenly, and there was a great danger of the mills being stopped. I went round and had public meetings and addressed the people, and pointed out that they should take steps, the same as I did, by calling together the Municipal Commission and getting a vote of 13,000 rupees, and dividing the city into wards, and appointing experienced Commissioners as Superintendents. The people then of their own accord built themselves camps. The Parsees built a camp of their own, and so did all the well-to-do people. Of course the poor people have not got the means of doing it, but the people realised that the evacuation of the infected area is the chief safeguard. Of course we have to make a distinction between the poor and the well-to-do classes. I do not see why people who live in two and three storeyed houses should not have their own way. If I had plague myself, I should like to be treated in my own bedroom, and I think these well-to-do people can perfectly take care of themselves in their own houses.

15,495. Do the people believe in the useful effects of perchloride of mercury in the disinfection of their houses?—I think they dislike it very much. Of course in a common mud hut it does not do much harm, but if you go into a wealthy man's house and spoil the whole of his walls which are painted, they dislike that very much, but then it is very rare indeed that plague cases get into the wealthy houses.

15,496. Have you any idea how plague has been spread throughout the city—whether it is by human beings going to visit their sick friends, or whether it is by rats, or in any other way?—I have not yet seen a dead rat, but I have a daily report as to whether any are found. I have heard of rats being seen dying. Mr. Dhanjishaw, the late Superintendent of Police, got information of dying rats having been seen in his house, and he came back to Broach from Surat and caused his family to leave and go into another house, and he had his house cleaned.

15,497. Had anybody been attacked in his house before rats were seen?—No, and nobody has been attacked since, because he took prompt and sensible measures.

15,498. Have you any instances of people being attacked twice with the plague?—I could not give an authentic instance.

15,499. How many villages have you had attacked in the Broach Taluka?—Two. One is Daigaum, where we have the case of a girl who was in the habit of coming in every day, and sitting at the corner of the street to sell milk; we have got her in a little hut. The other case is two miles out, and that is due to Broach people having gone out there.

15,500. Is there anything else which you would like to tell the Commission about, as we have not got a précis of your evidence?—The view which I hold very strongly is that all plague measures should be carried out with the utmost leniency and kindness and that in hospitals families should never be separated—if possible—that the husbands and wives and family should be together. I carried that out in Ankleshwar, where I have had a man with perhaps four or five children all round a sick bed, and I can scarcely give one instance of anybody being any worse for that. I attribute that to the excellent atmosphere which is maintained in a hospital. If these people remained with their sick in their own houses, where they shut up the doors and windows, so that the place becomes a hot-house, a forcing house for the plague bacilli, they would suffer; but in the hospitals where the doors are thrown open, and everything kept perfectly clean, and all evacuations destroyed, it seems to me the attendants are almost immune. I can give an instance of a postman whom I had in hospital some time ago. His wife was ill; she was the only patient at the time, and we gave him a cot and he nursed her. He was with her the whole time. She made a perfect recovery, and in fact he told us she was in much better health than she was before. I think that was due to the good food and treatment she got.

15,501. Is it found that if a case occurs amongst the people in the segregation camps, or in the huts all round the town, it spreads to other people in the camp?—I can only give a case of the Banniahs at Kukarwada who discovered an old woman with plague, and they moved her into the hut which they had prepared—a hospital hut. There she was segregated and there she died, but it did not spread to any of the others.

15,502. Apparently about 18,000 people have left the town of Broach. How many of these, approximately, are living in huts in the fields round the town?—A great many have gone to Ankleshwar, and many to villages in the Broach taluka: some to Jambusar and some to Amod. About 1,200 live in the huts put up by Mr. Clayton of the Whittle Mills, and about 800 in Mr. Smith's huts. About 1,000 are living in camps put up by themselves and under their own management. As the plague area increases, the number of people who go out into huts also increases, as people see the value of evacution.

15,503. In the case of the people who were camping out in huts round the town of Karachi, the experiment was tried of getting the communities to do their own hut to hut searchings, and their own isolation of plague stricken people and their own segregation of dangerous persons: these duties were not performed by the Government officers, but were entrusted to the leaders of the communities themselves. Has any such experiment been tried by you in the case of the Broach people who are camped out in huts in the fields round the town? And if so, with what results?—I do not know Karachi, and cannot say if the conditions there were similar to the conditions here. I have not, in words, given orders that the heads of communities should manage their own affairs, but this has been understood. They employ their own medical men, have their own hospitals, and do all that is necessary. They are visited by me, by Dr. Maynard, by my Personal Assistant, Captain Campbell, and by the Supervisors and Superintendent of the Ward in which they are located. The Kachhias have even gone so far as to keep a visitors' book. All camps welcome our visits. I generally am accompanied by a consignment of oranges, tea and sugar, supplied by our charitable fund, and, therefore, my visits are looked forward to. I find the Broach people behave admirably in camp, and we have no trouble.

Mr. R. E. Candy, I.C.S.

4 Feb. 1899.

15,504. (*Dr. Ruffer.*) Are you doing any inoculations at Broach?—I have been encouraging inoculation as much as possible.

15,505. How many people have been inoculated?—I suppose several thousands. The instance in which inoculation was of the greatest avail was in a village called Kantiajal, in the extreme south-west corner of the Broach district. Plague broke out in the rains, and I got the people to go out into the fields. I then got 700 people inoculated, and the plague stopped absolutely.

15,506. How many cases did you have before evacuation?—Six or seven.

15,507. All in one family, or scattered through the village?—Scattered about in the village.

15,508. How long did the people remain out in camp?—It varied.

15,509. They did not wish to go back to their villages?—No, they did not want to go back until the next rains.

15,510. Do you find much difficulty in persuading the people to be inoculated in Broach now?—Under the orders of Government I was obliged to abstain from using my influence in any way until lately. Now I encourage it through the Licentiates of Medicine, who are the private practitioners. We supply them with the prophylactic fluid, or rather M. Haffkine does, and they submit their returns.

15,511. Do they find much difficulty in getting people inoculated?—I think the Muhammadans and the Parsees—the Parsees especially—have gone in for it.*

15,512. I suppose you have no data as yet showing the efficacy of inoculation?—No; of course we give certain privileges to inoculated people.

15,513. Are the people inoculated out in camp, or in the town?—In the town.

15,514. (*The President.*) The inoculated people are allowed to remain in the town?—Yes, that is one of their privileges.

15,515. Do you know any cases of plague among the inoculated?—I think in Kantiajal there were a few instances of persons who died of inoculation, but they may have been ill before.

15,516. You have no case in which a person has taken plague a fortnight after inoculation, or more or less than a fortnight?—I cannot recall any case of that kind.

15,517. I understand that those areas which were affected have been evacuated in Broach?—Yes, the affected areas are evacuated.

15,518. How many people have been evacuated?—I have in my segregation camps now about 140 people, but we only keep them for 10 days. They go out and make their own arrangements then.

15,519. Do they return to the town?—No, we do not let them go back to their houses again. The houses that we have caused to be evacuated we seal up, and the city is patrolled by police.

15,520. How long do you keep them sealed up?—I have not thought about it yet.

15,521. You have not allowed any to return yet?—No. Of course business men are allowed to go out every day from camp to Broach so as to do their business, but they come back to sleep in the camps. They have to do that, because I believe the danger is from sleeping in an infected area. The well-to-do Banniahs employ watchmen to guard their houses. Of these watchmen two have already died of plague. That happened because they were very foolish men, and slept in the verandahs. Instead of that we now have the city patrolled by police who are not allowed to sleep.

15,522. Is the rate of incidence increasing or decreasing?—I think it is diminishing. The death-rate of two weeks ago was 99, and the week following that it was 79.

15,523. You think the deaths are six or seven per diem?—The deaths now per diem are about 12.

15,524. Of plague?—No. The present season has been an exceedingly unhealthy one; old people and children are dying. The present death-rate is 12, of which half are plague cases as a rule.

15,525. Where are these occurring now?—In different parts of the town. The last case was that of a man employed in the Broach Printing Press. It was a large house, and we caused all the inmates of that house to go away.

15,526. What about the neighbourhood?—No one has been directed to go away.

15,527. At the present time you are not carrying out evacuation on the same scale as you did before?—This is in the best part of the town.

15,528. There is no overcrowding or bad sanitary conditions?—No, I think not. I think the people will go of themseves directly they think there is danger.

15,529. (*Mr. Cumine.*) How did you find out whether cases were occurring amongst the people of Broach town voluntarily camped out?—Because we visit them.

15 530. (*The President.*) How often?—I could not say exactly. Dr. Maynard goes all over the place, and Captain Campbell is also very active.

15,531. There is no roll-call?—No. I leave them very much to themselves. All those who are in camp under Mr. Clayton's and Mr. Smith's supervision are looked after by those gentlemen, who are Ward Superintendents, and report all cases of plague. Those who are in other camps are under Supervisors and Superintendents who visit the camps and learn from the Headmen of the camps what persons are ill. The services of a medical officer are then requisitioned, and the case of sickness is diagnosed. No plague cases escape notice.

* A report on inoculation with M. Haffkine's prophylactic among the Parsees of Broach was later forwarded to the Commission, and is printed as Appendix No. LIII. in this Volume.

(Witness withdrew.)

(Adjourned till Monday, 6th February, at Surat.)

At The Castle, Surat.

FORTY-SECOND DAY.

Monday, 6th February 1899.

PRESENT:

PROF. T. R. FRASER, M.D., LL.D., F.R.S. (*President.*)

MR. A. CUMINE. | DR. M. A. RUFFER.

MR. C. J. HALLIFAX (*Secretary.*)

Lieutenant-Colonel K. S. NARIMAN, I.M.S., called and examined.

Lieut.-Col. K. S. Nariman, I.M.S.

6 Feb. 1899.

15,532. (*The President.*) You are in the Indian Medical Service and the Civil Surgeon of Surat?—Yes.

15,533. What are your medical qualifications?—I am a Licentiate of the Royal College of Surgeons, Edinburgh, and Licentiate of the Society of Apothecaries, London, and Licentiate of Medicine of Bombay University.

15,534. How long have you been here?—I have been here 11 years now.

15,535. You were present during the whole of the plague visitations?—I was.

15,536. And have taken a chief part in the treatment of the plague epidemics here?—Yes, under the orders of the District Magistrate of Surat.

15,537. You, of course, anticipated the possibility of plague being introduced into Surat?—Yes.

15,538. Because of its prevalence in Bombay?—Yes.

15,539. What measures did you adopt to prevent its introduction?—First of all we had railway medical inspection to prevent infected people from coming in. A special Hospital Assistant was indented for on the Surgeon-General and entertained by the Municipality from the 22nd October 1896, who inspected at the railway station all the passengers from Bombay and who was for a short time assisted by the local Assistant Surgeon.

15,540. You, in fact, make arrangements by which plague patients, and those suspected, might be intercepted at the railway stations?—Yes.

15,541. Did you make arrangements for intercepting them elsewhere?—Yes, by inspecting at the nakas to prevent people coming by road. We had arrangements at the nakas, and also at the different gates of the city. There are 20 nakas in the city, and at those nakas we made arrangements to prevent people coming with plague into the city, that is by road.

15,542. You have a large river here also?—Yes.

15,543. How did you guard the passage of that river?—We had inspections at the bandar. All the passengers coming by boat were inspected by a Hospital Assistant of the Civil Hospital. We had inspections at the Hope Bridge also, when plague was raging at Rander, a village about 4 miles from here, on the other side of the river. To prevent the importation of plague from that village we had medical inspectors at this end of the Hope Bridge.

15,544. Can you tell me how many people were examined at the railway?—I cannot tell you, but it was a very large number—hundreds of thousands, I should think.

15,545. How many cases of plague were detected at the railway station?—Ten.

15,546. Only ten out of these hundreds of thousands?—Yes.

15,547. How many suspicious cases were detained?—There were in all 18, of which eight were kept under observation; and they were not considered to be plague.

15,548. Roughly, how many were examined on the roads?—There must have been thousands coming and going.

15,549. How many cases of plague were detected by that examination?—Three or four, and all *bonâ fide*.

15,550. In addition to that, were there any suspicious cases?—No.

15,551. Having detected these cases of plague or suspected plague, how did you treat them?—For a short time they used to be sent to the contagious diseases ward of the Civil Hospital; that was at the beginning of the epidemic.

15,552. That is suspected cases?—Suspected as well as *bonâ fide*.

15,553. Where were they next kept?—Next in the Parakh Dharamsala close to the railway station. It was converted into a hospital.

15,554. For how long did you detain suspected cases?—Three or four days. If they were free from fever for three or four days, they were allowed to go.

15,555. To what extent were these precautionary measures successful in preventing plague from entering Surat?—For three or four months there was no plague. Then there was a great deal of communication with Bombay, which was highly infected, and ultimately the disease appeared here.

15,556. On what date was plague first imported into this city?—The first imported case occurred on the 8th of December 1896.

15,557. Who was this?—This was a resident of Bombay—a Muhammadan boy about 15 years of age.

15,558. Why did he come here?—He said he was proceeding further on—to Broach—but as he had his house here, he got down here with his father for a couple of days.

15,559. How did you discover this case?—There was a medical man at the railway station who used to examine all passengers, and this man detected the case.

15,560. Did any infected persons escape detection, and so introduce themselves into the city?—Not to my knowledge.

15,561. Following this, when did the next case or cases of plague occur?—They were all imported cases. The 1st case occurred on the 8th of December; the 2nd case was imported from Bombay on the 11th of December; the 3rd case was on the 12th of December; the 4th on the 13th of December; the 5th on the 30th of December; the 6th on the 30th of December; the 7th on the 3rd of January; the 8th on the 3rd of January; the 9th on the 8th of January; the 10th on the 11th of January; the 11th on the 13th of January; the 12th on the 13th also; the 13th on the 16th; the 14th case on the 19th; the 15th on the 21st; the 16th on the 23rd; and the 17th on the 24th.

15,562. Before it became indigenous, how many cases do you consider were imported?—Thirty-three.

Lieut.-Col. K. S. Nariman, I.M.S.

6 Feb. 1899.

15,563. These cases that we are now talking of were really not imported into Surat, as I understand they were intercepted at the entrances into the city?—At the railway station the first case I told you of, and several others.

15,564. Before the disease became indigenous, the cases you speak of as imported did not really come into the city?—Some escaped and some did not.

15,565. Some escaped your vigilance?—At the railway station some escaped our vigilance, but they were found out subsequently.

15,566. Which was the first case which escaped your preventive precautions and entered the city?—On the 11th of December, and he died in his own house.

15,567. There were intercepted cases, and cases that were imported and early detected. You sent them to the hospital?—Yes.

15,568. Is that outside?—No, inside.

15,569. You carried them actually into the city?—Yes.

15,570. You had no camps or hospitals outside the city?—No, all inside.

15,571. Some of them really entered the city, and were found in their houses?—Yes.

15,572. How were they found in their houses? What was the machinery which enabled you to detect cases which eluded your preventive measures?—We had house to house visitations, and we had Sanitary Inspectors who made inquiries. We also had the police. Those were our agencies in the beginning.

15,573. Were there subdivisions of the city which were inspected regularly?—Yes, the city was divided, and there were four or five Sanitary Inspectors to look after the health and cleanliness of the city, and these people made inquiries and found out any plague cases.

15,574. How did they make inquiries? Did they inquire at each separate house?—No, they did not go into each separate house.

15,575. What, then, was the method which was adopted?—They were getting rewards for finding cases out, and they had their own private agencies, and also the police. We used also to get anonymous letters from residents.

15,576. At this time there was no systematic inspection of the city?—No.

15,577. You offered rewards?—We offered large rewards.

15,578. What was the reward?—From one to ten rupees. First of all it was one to two rupees, and then it was increased to ten rupees for each *bonâ fide* case of plague.

15,579. How many people obtained a reward for having given you prompt information?—Thirty-three. The Sanitary Inspectors and the police constables were the principal informants. Police constables gave information of 16 cases in all and they received Rs. 54 as reward, while the Sanitary Inspectors gave information of 17 cases and they received as their reward Rs. 70.

15,580. Did you obtain any advantage from the rule framed under the Epidemic Diseases Act which made it compulsory to report all cases of plague?—Yes.

15,581. You got a certain amount of information?—Yes.

15,582. How many cases were reported to you under the provisions of that Act?—Notwithstanding the promulgation of rules framed under the Epidemic Diseases Act making it compulsory to report to the authorities in all cases of plague, owing to ignorance, perverseness, and prejudices of the masses it was not an easy task to detect plague cases in the city.

15,583. Under the rules that I refer to, who are the persons responsible for giving this information?—The inmates of the house, the nearest relations of the case.

15,584. Just take an ordinary family. Who would in that family be responsible for the giving of the information?—The head of the family.

15,585. The father, if he were alive?—Yes.

15,586. If he does not report, what happened?—He was prosecuted.

15,587. What are the possible penalties?—Simple imprisonment, or fine or both.

15,588. Did you enforce the penalty?—Yes, in some cases, through the District Magistrate.

15,589. You have already told us the disease became indigenous. Could you give us some account of the manner in which it became indigenous?—The first indigenous case occurred on the 21st of February, in a place in the city called Shapore Naran Tekra.

15,590. This patient was removed to the segregation hospital?—Yes.

15,591. How long did he live?—He died on the same day.

15,592. What did you do with his house?—It was disinfected.

15,593. How?—It was lime-washed simply.

15,594. Following upon this case, which was the next?—On the same day another Brahman boy living in the neighbourhood of the first case was taken to the Parakh Dharmshala, where he died on the following day (22nd). The father of the first case was attacked on the 22nd and died in the Parakh Dharmshala on the following day. A younger brother was attacked on the 24th and died on the 27th February. Thus between the 21st and 24th February three persons of the same family—father and two sons—and one person living in their neighbourhood, in all four persons, were attacked and they all succumbed to the disease.

15,595. With regard to the first indigenous case, have you traced its origin?—We could not.

15,596. The boy himself had been living here for a long time?—Yes.

15,597. There were, therefore, four cases, three in one house, and one in a neigbouring house?—Yes.

15,598. What kind of houses are they in this neighbourhood?—He was living in a pole—a sort of narrow street, and the neighbouring house was just next door.

15,599. What is the general character of the houses in that quarter of the town. Is it an overcrowded quarter or not?—Not very overcrowded, but rather overcrowded.

15,600. What was the kind of house in which the three patients died?—It was half kutcha and half pukka—not quite kutcha, nor quite pukka.

15,601. One floor or several?—Two floors.

15,602. A big house or small house?—A big house.

15,603. Had any rats appeared in this quarter before these cases occurred?—We could not get definite information as to that.

15,604. You inquired into that?—Yes, I inquired, but I could not get proper information. We were told that dead rats were found. I was told that, but I did not see them myself.

15,605. Did these first cases extend the disease to other parts of the city?—Yes, they went to another part of the city called Ambaji's Chakla.

15,606. They went there—was the district infected?—No, that part was not infected.

15,607. Did not the disease extend to other parts?—Yes.

15,608. What other parts?—Nanpura Machhiwad.

15,609. How did it originate there?—This was probably imported from Rander. The disease was prevalent there, and on inquiry it appears that three children had come to Surat with their mother, from Rander.

15,610. Therefore these were imported cases?—Yes.

15,611. And not infected from the first indigenous cases, but a fresh importation?—Yes.

15,612. Did this fresh importation produce any outbreak in this quarter of the town?—Not in that quarter at that time.

15,613. In which area, and when, did the next outbreak occur?—On the 26th of February, Rudherpura, a place chiefly inhabited by fishermen, darzis (tailors) and other low caste people, appeared to be infected. On that day four fishermen were found dead in their houses.

15,614. That is, towards the end of February?—Yes.

15,615. Do you know how these people acquired the disease?—I could not say. Probably they came in contact with fishermen from Rander.

15,616. Is that in the same quarter?—Yes, a little distant.

15,617. But they were likely to come into contact with each other?—Yes.

15,618. What did you do with the houses that you found infected?—They were all lime-washed, and the tiles were taken off, and they were evacuated.

15,619. When you said before that disinfection had consisted of lime-washing, did you in that case also remove the tiles?—Yes.

15,620. In every case?—Yes, we removed the tiles.

15,621. Therefore the disinfection has consisted of access of light and air in addition to lime-washing?—Yes.

15,622. What do you think was the general success of this method of disinfection?—So far as that epidemic was concerned, not a single case occurred in that house again.

15,623. People re-occupied this house?—Yes.

15,624. How soon?—They were allowed to come back in about a month, and no further cases occurred.

15,625. Plague, however, did extend in the town?—Yes.

15,626. Could you give me some general account of the amount and duration of the epidemic. This is the first epidemic, I think?—Yes, the first epidemic. I would like to hand in the following table:—

Name of Locality.	Imported.		Local.	
	Date on which the first Case occurred.	Number of Cases.	Date on which the first Case occurred.	Number of Cases.
Railway station	8th Dec. 1896	10*	—	—
Shápore	12th Dec. 1896	5	21st Feb. 1897	5
Nanpura	21st Jan. 1897	8	25th Feb. 1897	9
Rudherpura	—	—	28th Feb. 1897	8
Begumpura	—	—	3rd Mar. 1897	8
Gopipura	3rd Dec. 1896	8	22nd Mar. 1897	6
Haripura	23th Mar. 1897	3	19th Feb. 1897	6
Navapura	30th Dec. 1896	1	31st Mar. 1897	5
Segrampura	—	—	4th Apr. 1897	2
Mahidharpura	27th Jan. 1897	1	10th Apr. 1897	5
Asurbeg Dherwad	—	—	26th Apr. 1897	3
Rugnathpura	2nd Feb. 1897	1	26th Apr. 1897	3
Sayadpura	3rd Feb. 1897	2	29th Apr. 1897	5
Rustampura	26th Jan. 1897	2	—	—
Amroli	1st Feb. 1897	1	—	—
Katárgám	2nd Mar. 1897	2	—	—
Adajan	5th Mar. 1897	1	—	—
Ambaji Chakla	5th Mar. 1897	2	—	—
Nánáwat	29th Mar. 1897	2	—	—
	Total - 49		Total - 65	
	Total - - 114			

* Exclusive of 8 under observation.

15,627. Between what dates did the epidemic, in the first instance, last?—From the 8th December to the 11th of May.

15,628. What is the population of this city?—108,693, according to the census taken in 1891.

15,629. That is the normal population. At the period you are now considering, was it increased or was it diminished?—It was increased.

15,630. Why?—Because there was an influx of people from Bombay and other infected places. A large number had come from Bombay.

15,631. It was above the normal population at that time?—Yes.

15,632. In reference to the cases of plague that occurred, have you got any statement showing the number affected in regard to castes?—Of the different castes the Hindus suffered the most. Out of the total of 114 cases no less than 95 occurred amongst the Hindus. Of these 34 were imported and 61 indigenous cases. Of the remaining 19 cases 11 occurred among the Parsees (and they were all imported cases), and 8 among the Muhammadans, of which four were imported and four indigenous. It is very satisfactory to note that not a single indigenous case occurred among the Parsees, and the Europeans and Eurasians were quite free from the disease.

15,633. We cannot quite apprehend the importance of that statement unless you can also tell us what is the relative number of Hindus, Parsees, and Musalmans in the city. Have you a statement showing that?—The numbers are as follows:—Hindus, 72,568: Parsees, 5,893; Muhammadans, 20,377.

15,634. Was there a greater incidence in any caste especially, and in which caste?—The Hindus more.

15,635. Can you give us the total number relatively to the population of the Hindus in this city?—Among the 72,568 Hindus in the city 61 indigenous cases occurred, giving a ratio of 0·84 per mille of population. Among the 20,377 Muhammadans in the city four indigenous cases occurred, giving a ratio of 0·19 per mille of population.

15,636. Can you say that the Europeans and Parsees, relatively to the population, did not suffer much?—I could not state even that, because the Europeans are very few.

15,637. Is there any difference in the habitations of these different castes?—As far as the habitations are concerned, Europeans and Parsees generally live in more healthy localities. There is no overcrowding in their houses; but amongst the Hindus, of course, there is always overcrowding, the majority being poor.

15,638. And the Musalmans?—I do not believe that there is so much overcrowding amongst them as amongst the Hindus.

15,639. These are castes whose habitations are worse than those of the others?—Yes.

15,640. What about the habitations of the Eurasians?—There are very few Eurasians.

15,641. So far as they go, what are they like?—They are also like those of the Parsees and Europeans.

15,642. In regard to the mortality among the different castes, have you any information to give us?—I have prepared a table which is as follows:—

—		Hindus.			Muhammadans.			Parsees.			Total.			
		Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.	Males.	Females.	Children.	Total of Patients.
Reported	Imported	25	8	1	4	—	—	4	3	4	33	11	5	40
	Local	31	21	9	2	1	1	—	—	—	33	22	10	65
	Total	56	29	10	6	1	1	4	3	4	66	33	15	105
Discharged cured.	Imported	4	2	—	—	—	—	3	2	4	7	4	4	15
	Local	5	4	5	2	—	—	—	—	—	7	4	5	16
	Total	9	6	5	2	—	—	3	2	4	14	8	9	31
Died	Imported	21	6	1	4	—	—	1	1	—	26	7	1	34
	Local	26	17	4	—	1	1	—	—	—	26	18	5	49
	Total	47	23	5	4	1	1	1	1	—	52	25	6	83
Percentage of deaths to treated		79·0			75			22			—			

15,643. With regard to age, what do you say as to the incidence of plague?—Out of the 114 cases the majority of them were under 40 and above 10 years of age. There were only 15 cases whose age was above 40, and, curiously enough, there was the same number of children of and under 10 years of age. The youngest was a Parsee child, about a year and a half old; and the oldest was a Borah, about 56 years of age. In all, 15 children were treated; of these six proved fatal, giving a mortality of 40 per cent.

15,644. Is the mortality, relative to the mortality of other ages, a high or a low one?—It is rather a low one.

15,645. What information have you in regard to the incidence in the sexes?—The number of males attacked

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with the disease was (38 imported and 40 local) 78 against (11 imported and 25 local) 36 females. Of the 78 males 57 succumbed to the disease, or nearly 73 per cent. Of the 36 females, 26 died, or 72·22 per cent. Thus the percentage of deaths among females was much the same as that in the males, though the seizures were more than double in the latter.

15,646. Can you explain why more men were attacked than women?—I cannot account for it, because, in some epidemics, more females were found to be attacked.

15,647. We have often heard that more males were attacked than females; you cannot give an opinion about it?—No, I cannot state any theory on the subject.

15,648. What were the results of your treatment of plague cases in hospitals?—I have prepared a table of results, which is as follows:—

		Admitted.	Cured.	Died.
Civil hospital, Contagious disease ward - -	Imported	22	9	13
	Local -	8	2	6
Total - -		30	11	19
Parakh Dharmsala, Segregation hospital -	Imported	19	3	16
	Local -	47	15	32
Total - -		66	18	48

15,649. Could you give us an account of the varieties of plague which you have seen?—The bubonic and non-bubonic.

15,650. You class them into two great groups?—Two.

15,651. As to the bubonic, can you tell me where the buboes chiefly were?—The table is as follows:—

Glands enlarged.	Cases.	Percentage of total Cases.	Number of Deaths.	Percentage of total Deaths of each type.
Groin - - -	67	69·8	59	67·6
Arm-pit - - -	15	15·6		
Neck - - -	5	5·2		
Glands not enlarged -	9	9·4	8	89·

15,652. When you say groin or armpit, you do not distinguish between one side and the other, nor between one or both sides. Can you tell us whether any of these cases had buboes in both groins?—Generally in one groin.

15,653. Was it the right or left groin?—I believe it was in the right groin.

15,654. Will you give us this information with regard to the armpit?—The figures are as follows:—First epidemic: right armpit, 9; left armpit, 6. Second epidemic: right armpit, 102; left armpit, 84; both armpits, 3.

15,655. Did you see any pneumonic cases?—Yes.

15,656. Do you know how many?—Nine non-bubonic cases.

15,657. Did these occur at the commencement or towards the end of the epidemic?—Towards the end.

15,658. Do you think that was because they were not detected at the commencement, or was it because they really occurred chiefly at the end of the epidemic?—It might have been that they were not detected.

15,659. Have you any information as to whether bubonic cases ever produced the pneumonic form?—No.

15,660. Have you any information as to pneumonic cases producing pneumonic plague?—No.

15,661. What symptoms do you consider the most characteristic in the diagnosis of a plague case?—Of course, in cases of bubonic plague, there is bubo, high fever, delirium, congestion of the eyes, and dryness of the tongue—a peculiar condition of the tongue.

15,662. What is that?—A dry red colour, highly-coated all over on the general surface and red at the edges.

15,663. These, you think, are the most characteristic?—Yes.

15,664. In pneumonic cases, by what symptoms do you infer that it is pneumonic plague?—Of course, there is pneumonia and high fever and delirium, and the man having come in contact with a plague case in the same house generally.

15,665. Pneumonia and high temperature are ordinary symptoms in common pneumonia, of course. Therefore, the only additional condition you have mentioned is, that the patient has come in contact with a plague case?—Yes.

15,666. If you have no information on this last point when the patient comes under your care, could you know whether it was the pneumonic form of plague or not?—It is very difficult. The expectoration is more liquid and bloody.

16,667. You know of no distinctive symptoms at all?—If there is no gland, then I cannot tell a pure pneumonic case. I cannot diagnose except by a microscopical examination of the blood.

15,668. Did you make such examinations?—No, not here.

15,669. Therefore, all these cases were diagnosed purely by the fact that they had come into contact with a plague patient previously?—Yes.

15,670. And accordingly a number of these cases may not have been plague at all, but cases of simple pneumonia; they might, by accident, have come near a plague case?—It is just possible.

15,671. In none of these cases were you certain that it was plague?—It is certain that they came in contact with a plague case.

15,672. I put this to you; simple pneumonia might well occur in a plague house without it being plague, and if the only point which allows you to make certain that it is plague pneumonia is the fact that the person has come in contact with a plague case, therefore, none of these cases may have been cases of plague, but simply of pneumonia?—Yes.

15,673. What do you consider the most favourable prognostic conditions?—Absence of delirium, and if the man lives for about six days there is a great chance of his recovery.

15,674. Does the temperature afford you any criterion?—If the temperature is not very high, and if there is no sudden rise of it.

15,675. But it may have been high before the patient came to you—do you think a high temperature or low temperature of much value?—It is very difficult to say.

15,676. The temperature does not give you much guidance, you think?—No.

15,677. What do you think are the worst symptoms?—Delirium, vomiting, and purging.

15,678. What has led you to this conclusion?—Because all the cases in which there was vomiting and purging proved fatal. Not a single case recovered.

15,679. Every case in which you had vomiting and purging proved fatal?—Yes.

15,680. What do you think of the contagiousness of plague?—I believe it to be contagious to a certain extent.

15,681. Is it very contagious—for instance, would it be regarded by you as contagious as scarlet fever or smallpox?—No, not nearly so.

15,682. Why do you say that?—Because only a very few persons who come in contact with plague cases are attacked.

15,683. At the same time you have given us the history of three persons in one house becoming successively infected. What is your experience in hospitals as to contagion?—That in General Plague Hospitals very few attendants, though they came in very close contact with the patients, are attacked.

15,684. How do you explain the apparent difference in these two degrees of contagiousness? What are the

conditions on the one hand which seem to render it markedly contagious, and on the other hand which render it only feebly so?—It may be due to the personal cleanliness which is observed in hospitals, while in the peoples' houses there is not so much.

15,685. Is the house, as distinguished from the hospital ward, relatively a confined space?—Yes.

15,686. The hospital is not so confined?—No.

15,687. The house where plague is worst is a badly ventilated place, and is also badly lighted?—Yes.

15,688. Do you think these are important conditions?—Yes, they are.

15,689. Do you put them as high as cleanliness?—Yes.

15,690. Had you any experience of Haffkine's prophylactic fluid?—Very little.

15,691. Enough to lead you to any conclusion as to its value or not?—I do not think it was enough to do so.

15,692. How many inoculations came under your own observation?—In all I performed 121 inoculations. I inoculated 81 persons once, 34 twice, and 6 persons three times. None of these persons were attacked by plague.

15,693. But you cannot draw any conclusions as to its usefulness?—No.

15,694. Did you see any bad effects after inoculation?—No, I have not seen any fatal case. The re-action, however, in some cases were very severe.

15,695. What was the maximum temperature you noticed?—104°.

15,696. Was there always a temperature re-action?—In some cases there was no temperature re-action at all.

15,697. When, and at what intervals were the temperature taken?—They came three or four days afterwards to report.

15,698. Therefore, when you say there is no reaction, the person may have had the temperature taken only on the third or fourth day?—Yes.

15,699. And any rise in temperature may have escaped your notice?—If the people had fever they would come and tell us.

15,700. When did plague subside in the 1896-7 epidemic?—The last case was on the 11th of May 1897.

15,701. And you remained free from plague for how long?—For 54 days.

15,702. That would be in July?—Yes.

15,703. No fresh case was discovered between May and July?—No.

15,704. Had you any machinery for detecting cases which had not been reported to you; had you any system of examining houses and persons throughout the town?—Yes.

15,705. Will you describe the system?—From July to November I used to perform house to house visitations. I would go out into one locality one day, and into another locality the next day. I used to do that almost every day.

15,706. How many houses did you visit on one day?—Sometimes a hundred, generally between 50 and 60.

15,707. There must have been a good many hundreds of houses to be examined?—I had my assistant with me.

15,708. Perhaps you will describe the whole arrangement?—I received daily reports of the number of deaths in the city, and in any locality where I found the mortality greatest, without giving any intimation, I went there with a few policemen, and formed a cordon round the place. The inmates were asked to come and sit on the verandah to be examined.

15,709. How did you know who the inmates were?—We examined as many as came out; and then we went into the house to see if there was any concealed case. The people were examined first, and then the houses were thoroughly searched to see that there was no concealment.

15,710. You had no census of each house?—No, not at first. Afterwards a census was taken, but that was done by the Ward Superintendents.

15,711. That would be about November, 1897?—Yes. I did house to house visitation from July to nearly the middle of October.

15,712. I am talking of from May to July?—As the mortality was not high, and we did not suspect anything, I did not go every day. I went occasionally.

15,713. After the mortality rose you did what you described?—Yes.

15,714. Did you find that sufficient to detect all the cases?—No.

15,715. What did you do further to make your method of detection more complete?—Then the city was divided into so many wards. In the beginning of November, as desired by the Plague Commissioner, the ward system was introduced, and the city was divided into nine wards. Each ward was placed in charge of a Superintendent, who had native gentlemen of influence and position as his personal assistants, and subordinate Government servants drawn from different departments as supervisors and clerks. Ward Superintendents kept a census of the population in their respective wards. No one was allowed to leave or enter a ward without the permission of the Superintendents. All sickness of whatever kind was reported to Ward Superintendents, and all plague cases were removed to hospitals. If any attempt was made at concealment, the case was sent to the General Plague Hospital; in all other cases to the caste hospitals or to the General Plague Hospital according to the wish of the patient. In doubtful cases, medical opinion was obtained through me as Civil Surgeon. Each plague case was allowed one near relation as attendant in the hospital; all the remaining inmates of a plague house were removed to segregation camp, and those of the neighbouring houses to health camps. Of these, there were four authorised and several unauthorised; the latter were formed by people voluntarily shifting from uninfected localities to convenient places outside the city. In a locality where more than one case occurred within a short time, or where plague was found to be persistent, the whole locality was evacuated. All uncertificated deaths were treated as plague deaths, and the inmates of houses in which an uncertificated death occurred were segregated. Thus at one time nearly 34,000 persons (nearly one-fourth of the total city population) were located in camps.

15,716. By dividing the city into wards did you detect a good many cases?—A good many cases were detected in that way.

15,717. I suppose they were disposed of in the same way as in the previous epidemic?—Yes.

15,718. What was done to the houses in the localities where these cases were detected?—The houses were evacuated and disinfected in the same way as before, with the addition that they were first disinfected with a solution of perchloride of mercury.

15,719. The ordinary acid solution of 1 in 1,000?—Yes.

15,720. And then the houses were lime-washed?—Yes.

15,721. And, if necessary, light and air were admitted?—Yes.

15,722. Generally speaking, what kind of floors had these houses?—Generally speaking, they were mud floors.

15,723. Did you do anything with the floors?—The floors were scraped. Two or three inches of scrapings were taken off and removed.

15,724. What did you do with the scrapings?—The scraping were removed outside. They and the rubbish were set fire to, though not always.

15,725. When this was not done what was done?—The rubbish was allowed to remain exposed to the sun outside, in an open place.

15,726. Where?—In the ditches.

15,727. In the city or outside?—Inside the city, in the open places, as well as outside the city.

15,728. I believe you have a statement giving an account of the rise and fall of the epidemic, its duration, and the number of plague cases and of deaths from

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plague and from all causes?—The statement is as follows:—

WEEKLY PLAGUE CASES, PLAGUE DEATHS, and AVERAGE MORTALITY, from 1st December 1896 to 31st May 1898.

Week ending on the	Plague.		Total Deaths from all Causes during the Week.	Average Mortality.
	Attacks.	Deaths.		
7th December 1896	—	—	43	49·9
14th „ „	4	2	58	48·3
21st „ „	—	1	70	71·2
28th „ „	—	—	65	62·5
4th January 1897	4	2	61	65·1
11th „ „	2	1	67	62·4
18th „ „	3	2	79	63·4
25th „ „	5	4	86	64·4
1st February 1897	2	3	76	53·5
8th „ „	2	1	68	79·4
15th „ „	8	1	85	82·5
22nd „ „	6	4	96	72·7
1st March 1897	11	11	71	63·8
8th „ „	14	10	77	65 5
15th „ „	5	6	71	65·9
22nd „ „	4	2	73	56·1
29th „ „	7	5	76	69·9
5th April 1897	5	4	93	63·1
12th „ „	7	5	103	71·0
19th „ „	7	6	105	86·8
26th „ „	6	3	96	68·8
4th May 1897	11	7	116	128·0
11th „ „	1	1	84	107·3
18th „ „	—	1	78	87·3
25th „ „	—	—	62	80·3
1st June 1897	—	1	76	81·3
8th „ „	—	—	68	89·3
15th „ „	—	—	56	71·0
22nd „ „	—	—	52	54·0
29th „ „	—	—	56	50·6
6th July 1897	1	—	64	72·0
13th „ „	—	1	54	87·6
20th „ „	—	—	72	89·3
27th „ „	—	—	70	82·6
3rd August 1897	2	1	76	69·6
10th „ „	1	1	93	67·3
17th „ „	7	2	101	62·3
24th „ „	11	4	111	62·3
31st „ „	15	10	125	52·6
7th September 1897	25	17	157	52·0
14th „ „	22	14	143	52·0
21st „ „	40	22	156	58·3
28th „ „	35	26	176	46·3
5th October 1897	34	17	201	49·6
12th „ „	80	43	225	43·6
19th „ „	70	46	387	46·0
26th „ „	126	69	373	42·6
2nd November 1897	130	85	393	44·6
9th „ „	291	142	340	43·3
16th „ „	201	152	277	53·3
23rd „ „	154	121	264	51·3
30th „ „	102	78	191	46·3
7th December 1897	121	72	182	45·6
14th „ „	87	71	183	54·0
21st „ „	63	57	179	59·0
28th „ „	72	48	169	59·3
4th January 1898	86	57	161	63·3
11th „ „	77	56	161	59·3
18th „ „	63	53	149	65 3
25th „ „	47	39	138	71·7
1st February 1898	57	45	135	60 7
8th „ „	53	32	118	77·5
15th „ „	58	36	132	76·0
22nd „ „	81	50	134	80·5
1st March 1898	116	87	177	68·0
8th „ „	63	64	147	71·0
15th „ „	48	36	102	68·2
22nd „ „	51	38	109	61·2
29th „ „	24	19	99	72·2
5th April 1898	8	6	69	69·0
12th „ „	12	7	79	80·5
19th „ „	11	11	75	94·5
26th „ „	5	3	56	89·0
3rd May 1898	2	—	54	112·5
10th „ „	—	1	53	100·8
17th „ „	—	—	53	78·0
24th „ „	—	—	49	78·5
31st „ „	—	—	54	81·2

15,729. What was the result of the inquiries as to the introduction of plague during the second epidemic?—I am in the dark about that.

15,730. What are your surmises?—The poison may have remained latent.

15,731. After 54 days?—Well, I cannot account for it.

15,732. You spoke, I think, of evacuating the houses in which you detected actual cases of plague?—Yes.

15,733. Was the evacuation restricted to these houses, or did you proceed any further?—We proceeded further.

15,734. What did you do?—The neighbouring houses were evacuated, and if several cases occurred in the same locality, the whole locality was evacuated.

15,735. What do you mean by "locality"?—The whole length of the street, and if there were any people living behind the street they also were evacuated.

15,736. How long did the second epidemic last?—The last case occurred on the 1st of May.

15,737. You had it continuously from July, 1897, until May, 1898?—Not actually continuously. The first case was on the 4th of July, then there were no cases until the 30th July, but on that date we had two cases. From the 15th of August up to the 1st of May in the following year we had cases continuously, almost every day.

15,738. Then, apparently, you were not so successful in checking the second epidemic as the first?—No.

15,739. How do you account for that?—I cannot account for it, except that it occurred the second time during the rains, and we could not evacuate the people.

15,740. During a portion of this time there was no evacuation?—That is so.

15,741. In connection with the statement you have last handed in, can you show when you ceased to evacuate, and when you resumed evacuation?—Yes. The moment we began evacuation the number of cases, the number of deaths, and the total mortality always began to decline until February, when the people who were evacuated in the camp outside the city were allowed to come back into the city. From that date, again, the mortality increased, and the number of plague cases also increased.

15,742. When you resumed evacuation, what occurred?—Again it subsided gradually.

15,743. You said the epidemic practically terminated in May 1898?—Yes.

15,744. Have you had a third outbreak?—No.

15,745. You have had no plague since?—Except imported cases.

15,746. Have these imported cases generally been detected before they had done any mischief in the city?—Most of them.

15,747. Is the machinery which you have described of visiting the wards daily still in operation?—Yes. Instead of Ward Superintendents, personal assistants, and supervisors, Vigilance Committees of respectable native gentlemen are appointed.

15,748. Do you think you obtained information of all the cases?—Yes.

15,749. Since May, with the exception of a few imported cases of plague, there has been none?—There has been none.

15,750. How many imported cases have you detected since May?—Sixteen cases have been detected since May last.

15,751. Where were those cases found—at the stations, or in the city?—Some in the city, and some at the railway station.

15,752. With regard to those found in the city, have they been the cause of producing plague amongst other people in the city?—No.

15,753. What is the average mortality of the city in times when there is no epidemic of disease, and no plague?—55·4 per week.

15,754. I mean the average mortality per thousand?—About 26 per thousand.

15,755. What is the death-rate now per thousand?—About sixty.

15,756. Double?—Yes.

15,757. How do you account for that?—During the last three or four weeks the mortality has increased.

15,758. How do you account for that when there is no plague?—It may be due to the influx of people. A large number of people have been coming in. We are making inquiries as to the cause of the increased mortality.

15,759. You think there may be a large number of unhealthy people coming in who die from other diseases?—Yes, the mortality is chiefly confined to very young and very old people.

15,760. That is an indication that it is not particularly due to plague?—No.

15,761. You think you have a machinery by which you would be sure to detect plague?—Yes.

15,762. Am I right in understanding that practically every house in the city is visited daily?—I could not say that.

15,763. Who directs this machinery—who is responsible?—The District Magistrate, Mr. Weir. He will be able to give you an answer as to that.

15,764. Of the several measures which you have adopted, which do you think is the most valuable in the treatment of an epidemic?—Evacuation.

15,765. Has evacuation been carried out on a large scale?—Yes.

15,766. What is the largest scale upon which you have carried out evacuation?—At one time we had nearly 34,000 people evacuated.

15,767. Was that one area, or several?—Several.

15,768. You think evacuation is the most important step?—Yes; evacuation, combined with the disinfection of the houses.

15,769. Have you found any great difference between the results of disinfection when it was simply confined to making openings in the house and lime-washing, as contrasted with the additional disinfection by perchloride of mercury?—I have not noticed it.

15,770. Have you known instances in which disinfected houses have been again infected with plague? Where the houses were only opened out and lime-washed, was their reoccupation ever followed by a reappearance of plague?—I do not know of any cases where infection occurred after reoccupation. I have not come across any such cases.

15,771. Had they occurred, would they be certain to have come under your observation?—Yes. This refers to the first epidemic.

15,772. In addition to lime-washing, did you use perchloride of mercury?—Yes.

15,773. Were the houses treated in the first manner more or less numerous than the houses treated in the second manner?—Greatly less numerous; very many fewer houses were disinfected in that way.

15,774. Then you can draw no inference from that?—No.

15,775. Have you any good examples of the effect of evacuation?—I can give you one example—the Majura health camp, into which the people were evacuated. It was formed in November, and lasted until the 9th of February. The average daily population of that camp was 3,754, and the number of plague cases which occurred were only 15. After the first day three cases occurred: after the second, 1; after the third, 2; after the fourth, 4; after the tenth, 1; after the sixteenth, 1; after thirty-one to thirty-five days, 1; from forty-six to fifty days, 1; and from sixty-one to sixty-five days, 1.

15,776. Can you account for these cases which occurred after the tenth day?—Yes. Though they were living in camp, they used to go into the city in order to get things from the bazar.

15,777. There was a risk of their getting infection, as probably they went to their own houses?—Yes. In the second formation, in the same camp, there was a total population of 3,136. On the first day 12 cases occurred; on the second day, 2; on the third, 9; on the fourth, 4; on the fifth, 3; on the sixth, 3; on the seventh, 2; on the tenth, 2; on the eleventh, 4; from the sixteenth to the twentieth, 6; from the twenty-first to the twenty-fifth, 4; from the thirty-first to the thirty-fifth, 1. Total, 52.

15,778. These people became free from plague after going to the camp?—Yes.

15,779. Can you tell me to what extent they were being infected before they went to the camp? Have you a similar statement to show how many plague cases were occurring before they went into the camp?—No, I have not. There must have been a great number, otherwise they would not have been called upon to evacuate.

15,780. Could you give the number of cases that occurred in the wards from week to week before evacuation?—No.

15,781. I believe you have a statement showing the localities re-infected, with period of freedom?—Yes. It is as follows:—

STATEMENT showing LOCALITIES Re-infected, with PERIOD of FREEDOM.

Wards.	Population.	Plague Deaths, exclusive of those who died in Hospitals.	Houses Segregated.	Number of Persons Segregated.	Number of Houses Infected after Re-occupation.	Period of Attack after Re-occupation.
Rustampura Sagrampura.	12,873	40	153	583	—	—
Mahidharpura -	17,172	50	170	602	—	—
Nahanpura -	7,607	60	157	637	1	After 110 days.
Mulla Chakla -	8,734	18	87	337	2	After 47 and 75 days 1 each.
Kanpit - -	5,684	4	16	74	1	After 56 days.
Chauk Bázár -	7,087	13	66	249	1	After 31 days.
Gopipura - -	12,076	122	841	2,373	6	After 7, 14, 17, 28 days, 1 each, and after 20 days, 2 each.
Salabatpura -	6,069	26	33	165	7	After 3, 26, 62, 77, 80 days, 1 each, and after 13 days, 2 each.
Navapura - -	8,270	33	64	324	47	After 8, 11, 16, 21, 22, 23, 25, 26, 27, 28, 37, and 106 days, 1 each. After 4, 6, 7, 31, 34 days, 2 each. After 2, 5, 12, 13, 14, 15, 78 days, 3 each. After 17 days, 4 each.
Begumpura -	21,035	53	80	287	64	After 6, 13, 21, 29, 31, 32, 40, 58, 65 days, 1 each. After 3, 7, 10 13, 14, 20, 26, 36, 38, 41, 42, 49 days, 2 each. After 4, 17, 28, 39, 56 days, 3 each. After 5, 16 days, 4 each, and after 18 days, 5 each.

15,782. I see you mention Gopipura; was that infected after re-occupation?—Yes.

15,783. What kind of people live there?—They are well-to-do people.

15,784. How do you account for plague having occurred? I suppose the people lived in fairly good houses, relatively speaking?—Yes.

15,785. Are they large houses?—Yes.

15,786. How can you account for its having occurred?—I have no idea; it has occurred in good houses as well as in bad houses. In Salabatpura the houses are not very good; nor are the houses very good in Begumpura.

15,787. In the worst localities, what kind of accommodation is there in the houses?—Only one room.

15,788. In the localities where the houses consist only of one room, was there a recrudescence of plague after re-occupation?—Yes.

15,789. Will you tell me what were the facts of the occurrence of plague in the jail, and what inference you were able to draw from them?—The local subordinate jail affords a very good example of the beneficial results derived from the immediate removal of infected persons. Though plague was so very prevalent in the city, and some cases had actually occurred in close vicinity of the jail, it had enjoyed perfect immunity till about the middle of October, when

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cholera and plague appeared almost simultaneously. A prisoner, who was admitted into the jail from Pardi Táluka on the 9th October, was attacked with cholera on the 12th, and died the following day. On the 14th, all of a sudden, seven cases of cholera and one of plague, and on the following day six cases of cholera and two of plague occurred. Thus in all 16 cases of cholera and seven of plague were registered in about four days. With a view to prevent further spread of the disease in the jail, all the sick prisoners, with a sufficient number of attendants, were removed from the jail to the old Military Hospital in the Lines on the 16th, and since then not a single case of cholera or plague has occurred in the jail.

15,790. I believe, in India, prisoners generally associate in the one ward, they sleep in the same ward?—Yes. Those who had slept in the same cell with the infected prisoners were removed.

15,791. Do you mean that the contacts were made into attendants?—Yes.

15,792. Were there any cases of plague among the attendants on patients?—In the General Hospital none of the establishment were attacked with plague with the exception of a medical pupil.

15,793. Did you find out how he became infected?—He was coming in contact with plague cases.

15,794. Just the same way as the others?—Yes.

15,795. Did he go about with boots or shoes?—Yes. Nobody was allowed to go about without boots. They all wore boots or shoes.

15,796. Were there any pneumonic cases with which he might have come in contact?—I cannot remember. In the General Plague Hospital, with the exception, as I have said, of a civil medical pupil, none of the hospital establishment was attacked with plague. Out of about 900 attendants who lived in the hospital to look after their relatives, only 12 were attacked with plague. Of these, eight were attacked almost within 24 hours of admission, two within 48 hours, and one each on the 10th day and 20th day respectively.

15,797. What is your experience with regard to the Hindu Hospital?—In the Hindu Hospital, nine members of the hospital establishment, chiefly ward-boys, and 47 attendants were attacked. Of these, 15 were attacked before ten days, 14 between ten and 20 days, seven between 20 and 30 days, and 20 after one month.

15,798. What does the establishment consist of? What proportion is that of the total employed in this Hindu Hospital? It seems a large number?—Yes, it does.

15,799. Was there a large staff?—No, they have not a very large staff.

15,800. Do you know what the proportion would be?—About one fourth.

15,801. Do you mean to say that about one-fourth of the total establishment of this hospital were attacked?—Yes.

15,802. That is a large number, is it not?—It is.

15,803. How do you account for that?—Because most of them did not wear shoes.

15,804. I thought you said that they were obliged to wear shoes?—This is in the Hindu Hospital. Later on, when these people became attacked, I recommended them to wear shoes. I do not think they wore them always. I think they only put them on when I went there. Then there is another thing, namely, that the floors of the rooms occupied by the patients were made of earth; and perhaps the floors were not properly disinfected as those of the Civil Hospital were.

15,805. What are the floors of the Civil Hospital made of?—The floors of the Civil Hospital are of asphalt on the ground floor and wood on the upper floor.

15,806. And, therefore, more easily washed?—Yes.

15,807. Were any disinfectants used on the floors of the Hindu Hospital?—Disinfectants were not used so carefully in the Hindu Hospital, as in the case of the Civil Hospital.

15,808. Were disinfectants used at all?—Yes, but only partially.

15,809. Is there any other marked difference between the two hospitals?—There is the difference in the floors; and then there is the wearing of shoes.

15,810. Is the floor space the same in each hospital?—Yes, about the same. In the Hindu Hospital one side was quite *open*; it was a sort of open thing altogether.

15,811. Were the beds close together?—Yes.

15,812. Closer than in the other hospital?—No.

15,813. Have you seen any second attack of plague in any patients?—Not in the Civil Hospital, but in the Hindu Plague Hospital there were one or two suspicious cases.

15,814. Suspicious cases of a second attack?—Yes.

15,815. You mean, I suppose, that the second attack was a mild one?—Yes.

15,816. Not very well defined?—No.

15,817. (*Dr. Ruffer.*) Does your statement showing the localities re-infected, with period of freedom, give the total number of localities which were evacuated?—Yes.

15,818. In eight out of ten evacuated localities plague re-appeared in the evacuated houses?—Yes.

15,819. During the time these people were in the segregation camp, was the plague active in the various villages? Take, for instance, Rustampura Sagrampura. 153 houses were segregated. Was there plague in other houses in the town?—It is divided into wards.

15,820. Was there anybody left in that ward?—Yes, part of the ward.

15,821. Was there any plague among the people remaining in the ward?—I cannot say, there may have been.

15,822. I suppose plague may have been present in all the other wards?—Yes.

15,823. Do you mean to say that the infection remained in the house, or, were the people, on their return, re-infected from other houses in the same ward?—They might have been.

15,824. With regard to the Hindu Hospital, you said there was a staff of about 200 attendants, did the attendants remain there from the beginning to the end of the epidemic, or were they constantly changing?—Each plague patient was allowed two attendants at the beginning. Afterwards each patient was allowed only one attendant.

15,825. You say that 47 attendants were attacked?—Those 47 cases would refer to something like 3000 people.

15,826. Could you inform us what is the total number of children from one to ten years old in Surat?—I cannot say.

15,827. On what facts do you base your statement that children are less susceptible than females?—Because of the total number attacked.

15,828. But you can only say that, provided you know the total number of children; are there more adults than children?—I could not give you the total number of children.

15,829. Can you tell me what was the system of death registration in Surat before the epidemic began, how did you ascertain the daily number of deaths?—In the first place, it is incumbent upon the head of the family to give notice of death to the nearest police chauki. The police officer gives information to the Police Inspector who collects this information and sends it to the Municipality. The Sanitary Inspectors also make inquiries.

15,830. When do they make inquiries?—When they go round every morning.

15,831. Who are these Sanitary Inspectors, are they medical men?—No.

15,832. What class of people are they chosen from?—They are not scientific or medical men.

15,833. Have they any medical knowledge at all?—No, not at all.

15,834. What proportion of people are seen by medical men before they die? Out of one hundred dead people how many would be seen by qualified medical men before death?—Not more than three or four I should think.

15,835. So that in 97 per cent. of cases, there is only the diagnosis of the head of the family or the Sanitary Inspector, and neither of them have any medical knowledge?—That is so.

15,836. How was the death registration carried out after the epidemic broke out—in the same way?—No. We had the ward-system introduced then. The Ward Superintendents went round and made inquiries. It was incumbent on the head of the family, under penalty, to report every case of illness. The Ward Superintendents, personally, examined every case of illness.

15,837. Is the Ward Superintendent a medical man?—No.

15,838. Has he any medical knowledge whatever except what he picks up in conversation?—No, but in cases of difficulty or of doubt he refers to the Civil Hospital. I either send my own assistant or I go myself and inquire into the case.

15,839. Who are these Ward Superintendents?—When plague was raging they were responsible Government officers—most of them.

15,840. Were they appointed for that purpose?—They were chosen from Government officials.

15,841. Could you expect them to diagnose a case of plague pneumonia?—No.

15,842. Do you think they were capable of recognising a case of plague when they saw it?—I should think so.

15,843. Did they examine the women?—I do not know.

15,844. Had they any orders to examine the women?—In doubtful cases they applied to the nurses or to me.

15,845. I notice that the incidence of plague in women is very small here?—Yes.

15,846. Do you think it is possible that the deaths of women were not reported. Can you tell me whether the gross mortality from all causes among women has been smaller than among men during the plague epidemic?—The figures of gross mortality among men and women since December 1896 are as follows:—

	1896.			1897.			1898.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
January -	—	—	—	189	169	349	253	216	469
February -	—	—	—	176	159	335	296	267	563
March -	—	—	—	190	175	365	241	265	506
April - -	—	—	—	227	223	450	152	145	297
May -	—	—	—	178	158	336	—	—	—
June -	—	—	—	134	122	256	—	—	—
July -	—	—	—	165	133	298	—	—	—
August -	—	—	—	219	238	457	—	—	—
September -	—	—	—	331	364	695	—	—	—
October -	—	—	—	680	672	1,352	—	—	—
November -	—	—	—	507	499	1,006	—	—	—
December -	138	121	259	290	302	592	—	—	—

15,847. In the interval between the two epidemics had you some system of death registration?—Yes.

15,848. What is the system of death registration at the present moment; is it the same as before?—Yes; it is continuous now.

15,849. Supposing 60 deaths occurred in the town to-day, how many of those 60 corpses would be seen by medical men?—Perhaps one or two.

15,850. Then how do you know that there are no plague cases amongst those 60 people, if they are not seen after death?—They have been seen during life. Instead of the ward system, we have now a Vigilance Committee; and either the chairman or the members of the Vigilance Committee see this person. A report of sickness is sent to the chairman of the Vigilance Committee, and he personally goes and satisfies himself with regard to it. If he is satisfied, or if a certificate is produced from a qualified medical practitioner as to the cause of illness, then no further steps are taken; the man's name is only registered. But if the Ward Superintendent is in doubt, he asks for the assistance of the Assistant Surgeon who is especially appointed for the purpose.

15,851. Are the members of the Vigilance Committee medical men?—No.

15,852. How would they diagnose a case of plague pneumonia?—They would not be able to do so.

15,853. How would they diagnose an ordinary case of plague, unless they saw the bubo?—I do not know.

15,854. Do I understand that your diagnosis of plague at the present moment in the town is dependent on the members of the Vigilance Committee, and that the corpses are not examined?—The corpses are examined at the instance of the Vigilance Committee.

15,855. But in the majority of cases the corpses are not examined?—No.

15,856. You say in your evidence that the first indigenous case in the first epidemic was on the 21st February 1897?—Yes.

15,857. Another Brahman boy with plague was discovered on the 22nd?—Yes.

15,858. Had there been any communication between these two boys?—They were living in the same neighbourhood, and there may have been communication. It is very difficult to ascertain.

15,859. The third focus appeared on the 25th February at Rudherpura?—Yes.

15,860. The fourth focus appeared in the same place on the same day, and the fifth focus on the 6th March; in fact, they all occurred within ten days of one another. Does not that seem to point to the fact that there must have been several foci of plague already in the town, that the town was already infected?—It does point to that.

15,861. What was the gross mortality from all causes in the six months preceding the first indigenous case?—It was as follows:—

August 1896 -	358	November 1896 -	208
September 1896 -	272	December 1896 -	255
October 1896 -	238	January 1897 -	339

15,862. Was the mortality high?—I cannot say.

15,863. Could you add to your evidence what was the increase in the population preceding the first indigenous case owing to the sudden influx from Bombay and other places, also what was the mortality in children owing to the prevalence of small-pox and measles during that same time compared with similar months in the preceding year?—Yes. The increase in population was about 20,000. The mortality among children from small-pox and measles was as follows:—

Months.	Mortality from	
	Small-pox.	Measles.
August, 1895 - - -	—	—
„ 1896 - - -	1	1
September, 1895 - -	—	—
„ 1896 - - -	—	—
October, 1895 - - -	—	
„ 1896 - - -	—	—
November, 1895 - -	—	—
„ 1896 - - -	—	—
December, 1895 - -	—	1
„ 1896 - - -	—	1
January, 1896 - - -	—	—
„ 1897 - - -	—	5

15,864. Do you think people were more afraid of plague or of plague measures? Do you think they hid their cases on account of plague measures?—Yes.

15,865. What was the plague measure which they feared most?—Evacuation and segregation. I do not think they now fear it so much.

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15,866. (*The President.*) You think that this fear has disappeared?—Yes, because now they know the nature of the disease and the advantages they derive by segregation, and they do not so much object to it as they did before.

15,867. It was the result of ignorance before, and now they are better informed?—Yes.

15,868. (*Dr. Ruffer.*) How many cases of plague pneumonia did you discover by railway inspection?—I do not think there was a single case.

15,869. Did you discover any cases of non-bubonic plague—septicæmic plague—by railway inspection?—No.

15,870. They are the cases which would be most infectious?—Yes.

15,871. How many of the ten people who were detected at the railway station died, and how long after they were detected?—During the first epidemic, ten cases were detected at the railway station, exclusive of eight under observation; of these ten, three recovered, and seven died. Of these seven, one died after one day, three died after two days, two died after three days, and one died after five days. Of these ten cases, eight were bubonic and two non-bubonic. During the second epidemic, only one case was detected and that was cured. It was bubonic.

15,872. You say in your précis of evidence, with regard to house to house visitation, that the grounds upon which suspicion was founded were increase of mortality in any particular quarter or community, and receipt of information either by anonymous letters or otherwise?—Yes.

15,873. Did you detect a single case of plague by road inspection?—We did detect one near the Hope Bridge.

15,874. Can you tell me what kind of plague the first Brahman boy suffered from, whether it was pneumonic or septicæmic?—It was a case of bubonic plague distinctly.

15,875. On what symptoms did you base your diagnosis of non-bubonic cases, when the patient had no buboes and no pneumonia?—Delirium and high fever, and having come in contact with plague, that is, his being a member of a family in which plague had recently occurred.

15,876. Did you ever see a case of bubonic plague get secondary pneumonia?—Yes. Bronchial pneumonia was noticed in only two cases, of which one proved fatal and one recovered. The former was a woman from Daman, with enlargement of lymphatic glands in the axilla, and in whom symptoms of bronchial pneumonia had developed soon after her admission. She expired in the hospital on the seventh day after arrival in Surat. The latter was a Banniah who had come from Bombay, in whom the symptoms of bronchial pneumonia developed just as he was recovering from the other symptoms of plague after seven days after his admission into the hospital. He ultimately recovered, but the recovery was very tardy.

15,877. How do you know that not a single inoculated person died. Did you make special inquiries about that?—Yes, they were made to report themselves; not a single man reported that there was any case of death from plague.

15,878. They had to report if anybody was ill?—Yes.

15,879. Do you think that rule was followed?—There was not much plague then in Surat—very little. Most of the people whom I inoculated were fugitives from Bombay, and they wanted to get back to Bombay. They were intelligent people, and if any symptom of plague or any plague death had occurred, I should certainly have come to know it.

15,880. But supposing they had gone back to Bombay, now would you have known of it? I suppose a good many of them got inoculated in order to go back to Bombay?—Yes, but not immediately afterwards; they went back to Bombay after five or six days.

15,881. The history of these cases was not otherwise ascertained? It was not followed up?—No.

15,882. What was the gross mortality in Surat in the period elapsing between the two epidemics?—I have the daily figures. They are as follows:—

STATEMENT showing the TOTAL MORTALITY between the two Epidemics at Surat.

Date.	Total No. of Deaths.	Date.	Total No. of Deaths.
1897.		1897.	
1st May	15	16th June	4
2nd „	9	17th „	7
3rd „	13	18th „	8
4th „	11	19th „	13
5th „	12	20th „	8
6th „	10	21st „	2
7th „	12	22nd „	10
8th „	11	23rd „	6
9th „	12	24th „	12
10th „	10	25th „	8
11th „	17	26th „	12
12th „	10	27th „	7
13th „	15	28th „	4
14th „	8	29th „	7
15th „	10	30th „	11
16th „	8	1st July	10
17th „	18	2nd „	5
18th „	9	3rd „	6
19th „	5	4th „	11
20th „	13	5th „	8
21st „	14	6th „	13
22nd „	9	7th „	9
23rd „	8	8th „	6
24th „	5	9th „	11
25th „	8	10th „	5
26th „	15	11th „	6
27th „	11	12th „	10
28th „	13	13th „	7
29th „	14	14th „	11
30th „	4	15th „	11
31st „	7	16th „	12
1st June	12	17th „	8
2nd „	7	18th „	6
3rd „	10	19th „	11
4th „	8	20th „	13
5th „	13	21st „	10
6th „	14	22nd „	10
7th „	7	23rd „	13
8th „	9	24th „	6
9th „	8	25th „	12
10th „	9	26th „	12
11th „	0	27th „	7
12th „	8	28th „	13
13th „	17	29th „	6
14th „	5	30th „	16
15th „	9	31st „	14

15,883. Why did you evacuate neighbouring houses in a case of plague?—In the beginning only the house which was infected was evacuated, and then as the epidemic became more and more severe, neighbouring houses were evacuated. Then when many cases occurred in the same locality, the whole street was evacuated.

15,884. What principle guided you in evacuating neighbouring houses?—Because the infection might have been carried there by rats, and persons living in the neighbourhood might come in contact with a plague case.

15,885. Do people here visit very much from house to house?—Neighbours generally see each other—the females meet.

15,886. Have you ever seen a case of plague which you could trace to the rat?—No.

15,887. Did you have a large mortality among the rats in Surat during the epidemic?—No.

15,888. Did you yourself see dead rats?—I saw a few, but not a very large mortality.

15,889. It was not as marked as in Karachi?—No.

15,890. Do you think the rats played a part in the dissemination of plague here?—I cannot say.

15,891. You say in your précis that from about the middle of October, at the suggestion of His Excellency the Governor, a house to house search was carried on in different localities, and then further on you say that no one was allowed to remove from a ward or enter another ward without the permission of the Superintendents; do you think that rule was followed?—I cannot say that; I was not in charge.

15,892. But you have some knowledge of what happened. How do you think the Superintendents could prevent people from going to another ward? Were the wards closed by gates, or the entrance watched by policemen?—What happened was that they were not allowed to go into other wards to live. They could move about in them during the day, but they were not allowed to go into another ward to sleep.

15,893. How did the Superintendent ascertain whether the people slept in their houses or not?—I did not see it from personal knowledge, but I considered they had supervisors under them, and a regular system of inspection, and a census taken.

15,894. What is the average population of a ward? Two or three thousand?—More than that in most wards.

15,895. In Gopipura there are 12,000 people; how could the Ward Superintendent ascertain that all the people slept in their houses?—He had an establishment under him.

15,896. How many people?—He had a supervisor and several other clerks.

15,897. A dozen?—I would rather leave that to the Ward Superintendent to answer.

15,898. Do you think the people would let the supervisors go into their houses to see if they slept there?—They would let them into their houses, certainly, but not at night.

15,899. (*Mr. Cumine.*) I think you gave as one reason why the mortality is so high at present above the normal, that many people have come into Surat?—Yes.

15,900. Why have many people come into Surat above the normal number?—They are refugees from Bombay. Another reason is that it is the wedding season. Last year on account of the plague very few weddings took place. A large number of families come from different parts of the Presidency.

15,901. Would not the fact of its being the wedding season be a reason for as many people going out of Surat for weddings as come into it?—No, because Surat people have their trade in Bombay, and they come here.

15,902. (*The President.*) You mean the male members of a family belonging to Surat very frequently go somewhere else to work?—Yes.

15,903. (*Mr. Cumine.*) You explain the high mortality from January to April, 1897, by saying there was an increase of population owing to a sudden influx of people from Bombay and other places; but if plague was bad in Surat, why should they come into Surat?—It was not bad in 1897; very few cases occurred in those five months.

15,904. The mortality was high?—Yes, but they did not know there was plague here, nor did we.

15,905. The great majority of those anonymous letters which you received, saying that plague cases had occurred, were false, were they not?—Yes.

15,906. Would you act on anonymous letters again, or do you think that the annoyance caused in the great majority of cases when the letters are false counteracts the advantage in the cases where the letters are true?—I would pay every attention to an anonymous letter when there was no plague. Now, for instance, when we know there is no plague I should act upon it at once.

15,907. Have you noticed that the epidemic appears to decrease in virulence towards the end, that more cases appeared to recover towards the end of the epidemic?—Yes.

15,908. You say that after a complete lull of about 54 days a case was discovered on the 4th July in a Hindoo Ghánchi boy, and then up to the 30th July no cases were discovered, but on that date two cases were discovered; were those three cases particularly mild cases, or were they severe? Were they bubonic or pneumonic?—All three were bubonic.

15,909. Then you say the disease was not nipped in the bud in the very beginning, because one of the potent factors in stamping out the disease, namely, segregation of the infected and suspected, could not be carried out. But if you are correct in your belief that the first epidemic never really ceased, then those potent factors which you speak of, segregation of the infected and suspected, never succeeded at all in stamping out the epidemic, did they?—If there were any cases of plague they were not in an epidemic form in the interval. There were, perhaps, isolated cases here and there.

15,910. (*The President.*) There might have been fresh importations all this time?—Yes.

15,911. (*Mr. Cumine.*) Was the town ever completely evacuated?—No.

15,912. At the time when there were fewest people in the town how many do you think were living in the town?—From 70,000 to 80,000.

15,913. How many people had you in the voluntary camps?—I have no idea.

15,914. Do you find that people are readier to go out if they are allowed to settle where they like and put up their own huts than if they are expected to go into a Government camp prepared for them?—Yes. They would not go into the Government camp. There was an instance in point in the first epidemic. We built sheds for them, but they would not go in. We had started sheds for the Parsees, Hindus, and Muhammadans, but they would not go there. They left their own houses and lived in camps of their own, outside.

15,915. You speak of the people returning to the town in February, what was the reason?—Because of the rain; there was unusual rain, and the camps were very uncomfortable for the people, and therefore they returned.

15,916. How long did they stay in the town?—About a fortnight. They were allowed to go into the town on the 9th February, and the camp was again formed on the 23rd February.

15,917. Was the effect of staying a fortnight in the town bad?—Very bad, indeed.

15,918. Did you ever employ troops in house-to-house searches?—No, never.

15,919. Did you have any cordon round the town?—Never.

15,920. Was the disinfection of houses in the town done with perchloride of mercury independently of whether cases occurred in those houses or not?—I think it was.

15,921. (*The President.*) You said you thought that the virulence diminished latterly compared with the virulence at the commencement of the epidemic?—Yes.

15,922. What is your evidence upon that? Do you know the case mortality at the commencement, and the case mortality at the present time?—I have a general impression of it. I will give the statistics, which are as follows:—

—	January 1897.	February 1897.	Total.	Rate per Cent.	March 1897.	April 1897.	Total.	Rate per Cent.
Died within 48 hours	4	10	14	82·4	15	13	28	68·3
Died after 48 hours	2	1	3	27·6	6	7	13	31·7

15,923. Did you treat these cases of plague yourself in the hospital?—Yes, in the hospital.

15,924. Did these pneumonic cases come under your treatment?—Some of them.

15,925. Did you see them several times after admission?—Yes, every day.

15,926. Did you ever notice whether there was any œdema in the anterior wall of the chest and abdomen at any period before death?—No.

15,927. Since the epidemic has commenced a good deal of sanitary work has been done here. Is it an entirely new organisation in Surat which is undertaking this sanitary work, or is it an old organisation? Had it gone on long before the epidemic?—Yes.

15,928. You have only done extra work?—Yes, we have increased the establishment.

15,929. Why did you increase it?—In order to keep the town more healthy and sanitary.

15,930. It was not, in your opinion, sanitary before?—No.

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15,931. Is there any prospect of this increased staff being continued after the epidemic ceases in order to keep the town in a sanitary condition?—There is a prospect of it.

15,932. You introduced a water supply here?—Yes.

15,933. Is there a drainage scheme?—That is merely contemplated.

15,934. Do you think it is objectionable to introduce a water supply without a drainage scheme?—It is.

15,935. Why?—It would cause dampness; the soil would become water-logged.

15,936. Have you seen any bad effects here?—Not yet.

15,937. Are the houses generally furnished with ventilation openings of some kind in the worst localities of Surat?—No, except the entrance. There is sometimes no ventilation in the worst localities.

15,938. In which locality was plague most prevalent, the better or worse?—The worse.

15,939. Were you in charge of the disinfections in the town?—No; I only did disinfections at the beginning, that is before the introduction of the ward system.

15,940. You saw some of it carried out?—Yes, in the beginning.

15,941. How were the houses disinfected with perchloride of mercury? Did you apply the disinfectant with a pump?—We did it with a pump.

15,942. Were the clothes of the people disinfected?—Yes.

15,943. How were they disinfected?—They were washed with corrosive sublimate solution.

15,944. Of what strength?—1 in 1,000.

15,945. An acid solution?—Yes.

15,946. Were the people disinfected before they went into the segregation camp?—They were disinfected in the segregation camp itself.

15,947. The people, themselves, or only their clothing?—I was not in charge of the camp.

15,948. (*Dr. Ruffer.*) Could you add to your evidence a table showing the mortality from plague in the segregation camps?—I was not in charge of the segregation or health camps; but I have a statement here prepared from the files which I received from the Collector's office. One statement is with regard to the segregation camp, and the other with regard to the health camps. They are as follows:—

SEGREGATION CAMPS.

For the Week ending.	Average Population.	Total Mortality from all Causes.	Total Mortality from Plague.	Remarks.
12 November 1897	84	3	1	
19 „ „	746	4	1	
26 „ „	745	1	—	
3 December „	699	2	1	
10 „ „	580	4	2	
17 „ „	539	1	1	
24 „ „	451	7	4	
31 „ „	417	—	—	
7 January 1898	552	—	—	
14 „ „	570	—	—	
21 „ „	581	4	—	
28 „ „	528	1	—	
4 February „	395	—	—	Camp broken up on account of rain.
19 „ „	176	—	—	
26 „ „	171	1	—	
5 March „	532	4	2	
12 „ „	608	—	—	
19 „ „	486	—	—	
26 „ „	387	1	—	
2 April „	323	2	1	
9 „ „	209	—	—	
16 „ „	128	1	—	
23 „ „	128	—	—	
30 „ „	74	—	—	
7 May „	75	—	—	
	6,551*	36	13	

* Total number received in camp.

HEALTH CAMPS.

For the Week ending	Wariav.			Salabatpura.			Majura.			Delhi.			Remarks.
	Average Population.	Total Mortality from all Causes.	Total Mortality from Plague.	Average Population.	Total Mortality from all Causes.	Total Mortality from Plague.	Average Population.	Total Mortality from from all Causes.	Total Mortality from Plague.	Average Population.	Total Mortality from all Causes.	Total Mortality from Plague.	
12th November 1897	—	—	—	3,000	16	12	150	2	2	3,000	18	13	
17th „ „	120	2	1	5,300	20	15	497	—	—	3,539	12	4	
26th „ „	526	1	1	5,412	17	8	2,237	3	—	3,598	9	2	
3rd December 1897	1,095	1	—	5,470	27	11	2,863	4	—	3,700	4	1	
10th „ „	1,540	3	1	5,455	10	3	2,883	2	—	3,719	7	3	
17th „ „	1,688	1	—	5,392	12	5	2,949	2	—	3,764	4	1	
24th „ „	1,881	4	—	5,446	5	2	2,885	2	—	3,802	8	1	
31st „ „	1,647	6	—	5,446	10	4	3,092	5	—	3,790	6	3	
7th January 1898	1,764	2	1	5,417	6	1	3,044	5	—	4,113	3	2	
14th „ „	1,859	2	—	5,444	14	9	4,097	6	1	4,250	8	5	
21st „ „	1,846	3	1	5,437	12	6	4,374	5	—	4,290	18	11	
28th „ „	2,479	3	—	5,543	10	3	5,083	3	—	4,389	7	2	
4th February 1898	2,444	5	—	5,429	18	6	4,603	2	—	4,290	6	3	Camp broken up on account of rain.
19th „ „	—	—	—	—	—	—	—	—	—	—	—	—	
26th „ „	8	—	—	—	—	—	—	—	—	—	—	—	
5th March 1898	497	—	—	—	—	—	1,809	1	—	—	—	—	
12th „ „	1,237	2	—	—	—	—	2,760	5	1	—	—	—	
19th „ „	1,573	4	3	—	—	—	3,717	2	1	—	—	—	
26th „ „	1,815	2	—	—	—	—	4,034	6	1	—	—	—	
2nd April 1898	1,678	2	—	—	—	—	4,106	1	—	—	—	—	
9th „ „	1,473	—	—	—	—	—	4,146	1	—	—	—	—	
16th „ „	911	—	—	—	—	—	2,803	3	—	—	—	—	
23rd „ „	264	—	—	—	—	—	1,498	2	—	—	—	—	
30th „ „	61	—	—	—	—	—	1,122	—	—	—	—	—	
7th May 1898	—	—	—	—	—	—	101	—	—	—	—	—	
	6,551*	43	8	5,748*	177	85	10,737*	62	6	4,598*	110	51	

* Total number received in camps.

(Witness withdrew.)

Mr. H. M. JUDGE, called and examined.

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15,949. (*The President.*) You are Assistant Collector of Salt Revenue here?—Yes.

15,950. (*Mr. Cumine.*) You have come to tell us about Daman and the cordon used to protect British India against being infected by Daman?—Yes.

15,951. Do you know what the population of Daman is?—Approximately, the population of Lower Daman would be from 7,000 to 8,000, and of Upper Daman 5,000, but there is no proper census at Daman.

15,952. It is Portuguese territory, is it not?—Yes.

15,953. Is it surrounded on three sides by British territory?—Yes.

15,954. And on the fourth side by the sea?—Yes.

15,955. Is there only one town in that territory or are there several villages besides?—There are several small villages besides.

15,956. Do you know what the religion of most of the inhabitants is? Are they Christians or Musalmans or Hindus?—Most of them are Hindus. There is a large population also of Muhammadans, and some few Portuguese Christians.

15,957. Do you know when plague began in Daman?—In February 1897.

15,958. Is that the month that it was discovered in?—They allege that they discovered the first case.

15,959. Will you tell us the circumstances of the outbreak of plague in Daman?—At Daman, at about the end of February 1897, a country craft came from Karachi (at which place plague was raging). She was put into quarantine, but the Portuguese methods not being stringent, the crew managed to smuggle themselves ashore to their home, and some of them developed plague and a woman, a resident of the house, became plague-stricken. The disease first confined itself to the Machis (the sailor caste); it then appeared among the Banniahs, and finally broke out among the Muhammadans, and approximately about 3,000 out of a population of 7,000 died of plague. All intercourse was cut off between Upper and Lower Daman by the Portuguese authorities, and the disease did not in 1897 get across the river. The disease appeared to die down in the monsoon, but Lower Daman was never entirely free from plague during the year; a recrudescence took place in November 1897 and the prohibition as to intercommunication between Upper and Lower Daman having been relaxed, the plague got across the river and an epidemic broke out in Upper Daman; in this second epidemic, I think, about 1,000 people perished.

15,960. Will you tell us whether any specially noticeable feature occurred in the epidemic in Daman?—A noticeable feature in this epidemic was that the Fort, situated between Upper and Lower Daman, was closely guarded and the inhabitants were not allowed to have any intercourse with people outside. All precautions taken, however, did not serve in keeping out infected rats, and in about 40 houses in the fort dead rats were found. Notwithstanding this, however, no single case of plague occurred in the fort.

15,961. Have you any knowledge yourself of what was going on inside Daman town?—Yes.

15,962. How?—I used to go inside.

15,963. How often?—During the worst part of the epidemic I was camped on the frontier, and I would go into the town twice or three times a week. I had my boat there at first. Afterwards I used to send sepoys in, who used to count the death-fires and so on.

15,964. When was communication between Daman and British India first restricted?—In April, I think. Before intercourse was strictly prohibited there was also prohibition of village intercourse. The Patels and other people were ordered to prevent intercourse with other villages.

15,965. I think that the period following on the outbreak of plague at Daman is divisible, as regards the cutting off of intercommunication between Daman and British territory, into three parts—first, the time when intercommunication was unrestricted; second, the time when it was completely stopped; third, the time when it was open to certain persons. Please say whether this is correct; and if so what the approximate dates of the three stages are?—Yes; intercommunication was unrestricted up to the 30th March as the plague was simmering in Daman in February and only disclosed itself in March. From the 30th to the 16th April, approximately, intercommunication was entirely prohibited. From the 16th of April to October 1898 intercommunication was permitted under certain rules.

15,966. Could you tell us what the rules were under which intercommunication was allowed in the third period?—With reference to persons, persons of respectability and *primâ facie* not suspicious were granted passes. These persons had to produce certificates from a medical man stating that the pass-holder was free from plague and had not been living in an infected house. On production of his pass and certificate at Chala he was examined by our own medical man and if found healthy he was allowed to proceed after disinfection of his baggage. People without passes presented themselves at the frontier station at Chala and those that were found healthy were admitted into observation camp after a bath in disinfectants, and disinfection of their baggage by boiling and exposure to the sun. After a detention of 10 days they were allowed to proceed on their journey if found healthy. As for goods, a plot of ground on the frontier was selected, and goods were taken there under an escort and deposited there, after which the cartmen returned and the cartmen from Daman then came with their carts and removed them to their destination.

15,967. In ordinary times is there any special reason why the inhabitants of British villages should go into Portuguese territory?—They have a liquor contract there. It is sold for a great deal more than it would actually fetch if it were restricted for consumption in Daman. They sell their liquor extremely cheap: in fact they undersell us. They charge 2 annas a bottle, whereas we charge 8 annas and 12 annas. For the purpose of encouraging our villagers, they have shops conveniently placed all round their territory. Consequently a large number of our villagers on any festivities and other occasions adjourn to these shops, mingle with the Portuguese people, and have their big drink, and come back again.

15,968. Was this frequenting of Portuguese shops forbidden by any Revenue Officer when plague was discovered in Daman?—No.

15,969. Of what was the cordon composed that you placed between British India and Daman territory?—We increased the salt cordon by 60 men and removed it to the territorial frontier. On the map you will see our salt line runs behind some of our villages.

15,970. Will you put in a map showing the position of the different posts of the cordon?—It is published as Map No. 20 in Vol. IV. of "The Plague in India 1896, 1897," compiled by Mr. R. Nathan, I.C.S.

15,971. Did you cut off these British villages throughout the whole period of the cordon?—At first we cut off four British villages and four hamlets, but on application by them we removed our line and included them within it. Eight villages, including hamlets, were cut off, but only for a very short period.

15,972. Although there was for a certain period no cordon between these 8 villages and Portuguese territory, did plague ever get into those 8 villages?—No.

15,973. When did you move your cordon forward so as to follow the exact line of demarcation between Portuguese territory and British territory?—On the 19th April 1897.

15,974. The salt cordon which you speak of is the customs' cordon to prevent smuggling from Portuguese territory into British territory, is it not?—Yes.

15,975. What was the total strength of your cordon when it was at its strongest?—In all, 333 men, *i.e.*, two European Inspectors, one temporary European Inspector, one Sarkarkun, seven Karkuns, two Nakadars, and 320 men.

15,976. What was the number of men on duty at any one time on the line? How far were they apart?—I think about eight men to a chauki. There were four men on duty at night, that is, half the force would be on duty at night.

15,977. Besides your salt chaprasis on the cordon, had you any assistance from any police there?—They have police chaukis which march parallel and somewhat behind our line, at which there are guards who keep Daman under observation for dacoity, that is to prevent

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dacoits coming across, looting our villages, and getting back again. We have no treaty with Daman and therefore a man might commit murder and go over to their territory and be safe. There is, therefore, a force behind us, and they were ordered to co-operate by the District Magistrate and by the Superintendent. They acted as a check on our Sepoys. If our men let people through, there would be a probability of their being caught by the police, in which case a man would be liable to dismissal or other punishment. Beyond that, there was a third line of defence. First our own, then the police, and then the villagers themselves. If they found villagers coming from Daman into their place, they reported the fact to us. In that way there was a third check on our own working, which would prevent about 2,000 people escaping through our lines.

15,978. Do you know of any instances where the village officers arrested, or at any rate refused to receive into their villages refugees from Daman?—No, there were no cases.

15,979. Please describe the operations of the cordon?—Along the whole 38 miles to be guarded, a path, about 10 feet wide, was demarcated by boulders and clods of earth, and the path roughly cleared and made practicable for patrolling by night and day. Along this path there are 39 chaukis taken into use (including 17 new ones), thus giving chaukis about one mile equidistant from one another. The men off duty were not allowed to leave the chaukis, excepting with leave from their Amaldar, and, as the chaukis are in most cases visible from one another, this ensured a guard visible to each other in the day. At every mile two sentries were put on duty between each chauki during the day, and consequently with the men off duty at the chaukis at every 552 yards there was a man on watch during the day. The whole force went on duty at night. Advantage was taken of the conformation of the territorial frontier and the existence of two tidal rivers to decrease sentries in one direction and increase them in another, and along the principal part to be guarded I was enabled to place eight men per mile and in the other about six men per mile at night and half of these men went on sentry-go while the other half went to sleep on the line at places selected by myself and equidistant from one another. By these means at, approximately, every quarter of a mile there was a man asleep and likely to be awakened by persons or vehicles passing, and in the 440 yards between each sleeper there was a sentry patrolling. Where roads bisected the cordon, modifications were made by placing a chauki or sentry post, &c. to guard them. At every other chauki there was an Amaldar placed whose duty it was to see that the men went on duty during the day, and twice every night he had to patrol over his subdivision of two miles, called Naik's beat, and see the sentries were alert. The line was again divided into four divisions, called Jamadar's patrol, and each division placed under a Jamadar (three Jamadars and one senior Havildar being utilised) who had to see that orders were carried out, occasionally visit the line, and once in every 24 hours, either by day or by night, at irregular hours, go over the whole of their division. The line was again divided in two major divisions and placed under the Inspectors who had to visit their respective beats on four nights and two days during each week and at such irregular hours as they deemed fit. The Inspectors each also had a small detective party under an Amaldar, who could be utilised by being sent out to pay surprise visits along the line, or should any particular sentry on beat come under suspicion could be sent out quietly to watch behind the said sentry or beat, and arrest anyone improperly let through. As such an arrest would lead to the dismissal of the offending sentry, and possibly to his prosecution, no sentry was safe if he attempted to accept a bribe. You will thus see that the line being strongly guarded by sentries, about one to a quarter of a mile, constantly patrolled by Amaldars, and regularly visited by the supervising staff, it was absolutely impossible for persons to get across during the day unperceived and next to impossible for them to do so at night. Now as all the roads were guarded, and as ordinary passengers would not be able to find their way over the fields at night, and when in addition to finding their way they would have to evade a strongly guarded cordon, it will be seen that the task of crossing the cordon was, for ordinary persons, rendered impossible at night also, even for healthy persons. Pardi taluka and places adjacent to the cordon were singularly free from plague during the existence of the cordon, notwithstanding the existence of a severe epidemic in Daman territory. Subsequent to the removal of the cordon there has been in January 1899 a slight recrudescence of plague in Daman, and notwithstanding the fact that the recrudescence has been only slight, yet subsequent to this Daman recrudescence and after the removal of the cordon, Pardi town has been infected and has had to be vacated. Umersadi in Pardi taluka has become infected. Houses are being vacated at Pathurpunja, near the frontier, in consequence of suspected plague from Daman. Two cases imported from Daman were discovered at Vapi, near the frontier, and the houses had to be vacated. &c., and one case of plague imported from Daman has been discovered rail-borne at Surat. I think therefore it is fairly clear that the British territory was safer with the cordon during the severe epidemic at Daman than they were and are without the cordon, even when facing only a slight recrudescence of plague at Daman.

15,980. Were the two Inspectors Europeans? And were they the only Europeans you had?—For four months I had three European Inspectors; subsequently I had two.

15,981. How could you prevent people going by sea?—We relied upon our quarantine rules to protect our ports. We could not prevent people leaving by sea.

15,982. Was there any reason why people should have run away from Daman?—Yes, the mortality was very severe.

15,983. Was the Portuguese Government taking any measures such as house-to-house searches and segregation of contacts?—They tried to do so, but the population was too strong for them.

15,984. Then that motive for running away did not exist?—No.

15,985. With regard to the majority of the inhabitants of Daman, if they wanted to leave Daman what place would they be likely to go to, having in view their religion and their relationships? Would they be likely to go to neighbouring British villages or to some distant places?—A good many intermarried in Pardi, and I found a good many came to Surat. A great number would have gone to Bombay but for the plague there.

15,986. Did any villages in Pardi get infected with plague at all that year?—I believe that Kolak did.

15,987. Do you know if it got infected from Daman?—No, not as far as I know.

15,988. Did any people attempt to pass your cordon and get arrested?—A few.

15,989. Do you remember how many?—139.

15,990. Supposing that people had successfully passed your cordon, how would you have known of it?—If they had successfully passed our cordon and got into some of the adjacent British villages we should have known that from the Police Patels, but of course, if they got away by rail we should have no mode of tracing them.

15,991. A certain number of people were allowed to pass through with passes?—Yes.

15,992. And a certain number of people were detained in observation sheds and then allowed to go?—Yes.

15,993. Out of those people who were detained under observation how many developed plague?—Four.

15,994. How many were detained under observation?—The exact number is 2,768 persons.

15,995. Did any of the Daman villages—as contrasted with Daman town—get infected?—I think one or two may have escaped, but most of them got infected.

15,996. Most of them?—All the principal villages, such as Upper Daman, Dholer, Kalikachigam, Kharwari, Wadkund, Dabhel and Bhimpur were infected.

15,997. Before the cordon got into working order, I think there was an exodus of about 2,000 people by land from Daman: is that so?—There was an exodus, but then there was also a large migration to Daman, and a good many people were expelled. A large number of people went to Daman from Bombay.

15,998. What I want to know is whether, just before the cordon was put on, a large number of people came out of Daman by land?—Yes.

15,999. About how many?—I could not state.

16,000. If the neighbouring British villages were not infected by the large number of people who ran away before the cordon was put on, how would the immunity of the neighbouring British villages to the end show that a considerable number of people did not escape *through* the cordon? One of the reasons given for thinking that the cordon was effective is that the neighbouring British villages did not get infected. But if a large number of people could, in the pre-cordon days, run away without infecting those villages, could not a large number during the cordon days run through your cordon without infecting those villages?—The majority of those people that left were Bombay people and outsiders, not resident in the adjacent taluka; and before the cordon was put on every village had orders not to admit strangers as inhabitants, so that there was a check in existence before the cordon. Though a village neighbouring on an infected place does not get immediately contaminated if the villagers continually go to the infected place the probability is that that village will become infected, because though one visit or a few visits do not necessarily imply infection, a continual state of intercourse would, I think, undoubtedly bring infection.

16,001. About what date did plague finally disappear from the Daman territory?—In October 1898, but since then I believe they have had four suspicious cases in December.

16,002. When was your cordon entirely removed?—In October. With reference to the question of admission to the segregation camps and the number of plague cases found at Daman, the system we had was that the doctor went to the frontier and all people who applied for admission were examined. If they had any suspicious symptoms they were returned. We did not take any risk of getting our camp infected if we could possibly help it.

16,003. Is there anything within your personal knowledge as to the results of inoculation in Daman?—I can only say what the people say: I have made no personal observations.

16,004. Will you give us your experience in Surat with regard to plague?—In Surat, in February and March 1897, I was engaged in house-to-house visitation. The plague appeared to die down, but on its recrudescing, in order to assist the Collector I again took up house-to-house search in September. The methods employed were searching of suspected quarters, and when a plague case was found or became known to have taken place, the disinfection of a large number of houses in the neighbourhood and in some cases the evacuation of a whole street. As far as my observation went, house-to-house search was of no practical utility, and inflicted the maximum of inconvenience on the people with minimum results as to the discovery of plague; and the wholesale disinfection of houses and evacuation caused the inhabitants to combine in concealing plague cases occurring in their midst in order to avoid disinfection and evacuation. Anyhow, the methods adopted did not stay the epidemic which kept on increasing. In November, the ward system was adopted, which aimed at combating the disease by the earliest possible removal of a plague-stricken person to a hospital and the segregation of his contacts, and I took charge of a ward of Surat. Having observed that the plague spread in circles of castes (*vide* Daman) and that a plague-stricken house was not *quo ad* house a danger to its neighbouring houses, in order to encourage people to come forward with information as to plague cases, I — with the concurrence of Mr. Moore, the Collector—notified that if the inhabitants of a house or his neighbours brought me information of a plague case, the houses on each side of the plague case would not be disinfected nor would the inhabitants be segregated.

16,005. When did you issue the notification?—About the 3rd November. This had the effect of breaking up the conspiracy of silence as to plague. And if a sick man's relations did not give information, his neighbours, in order to avoid disinfection of their houses and segregation, came forward and gave information of the case, and the earliest removal of sick people to hospital was effected, with the result that in one month the disease was reduced fifty per cent., and the decrease was steadily maintained till in April it finally disappeared and has not appeared again in Surat.

16,006. How do you think plague spreads from house to house within a town?—With reference to dissemination, I noted that the disease spread itself in circles of castes, which would seem to point to the disease spreading from one family to some other family on visiting terms with it, and so spreading in circles of acquaintance, and the fact of the Daman cordon having prevented its advance into British territory seems to show that where human intercommunication ceases the disease cannot move forward.

16,007. But the cordon which you speak of was the cordon between Daman town and the villages, was it not, whereas the spread in the town of Surat was a spread from house to house?—That is so. In Surat, though the houses neighbouring the one in which a case occurred were not touched and the inhabitants not moved—that is subsequent to the ward system—no cases occurred in them in consequence of their mere contiguity to an infected house; on the other hand, in attempting to trace the spread of the disease, I have very nearly 200 depositions, in as many cases, showing that the sick person developed plague shortly after visiting a friend or relation who was sick or had died from plague. My experiences of plague both in Daman and Surat, therefore, point to the disease spreading in a community along the lines of human intercourse. Further, I noticed that my staff, though continually in infected houses and after handling plague-stricken persons, did not, as long as they kept themselves booted and washed their hands, get attacks by plague; but a carpenter in my employ, who cut his foot with an adze and discarded his boots and went on opening up a disinfected house for ventilation, developed the disease though he had no relatives ill of plague and lived in a healthy part of the town.

16,008. Though that would show that the carpenter might have got plague in that particular way, it does not show he might not have got it any other way, does it?—It would not be conclusive evidence, but he was working with us daily and we knew his movements.

16,009. Have you any map of the ward to show how infection goes from house to house, carried by relations?—I have a photograph of it which I put in. (*See* Question No. 16,045.)

16,010. Were all houses in your ward disinfected with perchloride of mercury?—The infected houses only.

16,011. In any house disinfected by you, though not with perchloride of mercury, did you ever have a case of infection occurring after the people returned to it?—I do not think there was any house which was not disinfected with perchloride of mercury.

16,012. Have you any case in which people were infected because of returning to their houses which had been disinfected with perchloride of mercury?—We used three things altogether: ventilation by opening up the house, white-washing the floor, and perchloride of mercury. That is to say we first sprayed the house and rendered it fairly safe for our man to work in, then we put in a carpenter and opened the house for ventilation, and then white-washed it. After that we have no case on record in my ward.

16,013. Do you know of any cases where houses back to back have been infected, although the second house is not in communication with the first?—Yes, there would be cases.

16,014. Could they be explained by your theory of the plague being carried by relations?—Yes; the removal of the position of the houses would not alter the argument of the spread of the disease being by relations. If a house at one end of the street is infected by intercourse, the house at the back may just as well be infected by intercourse.

16,015. Have you any personal knowledge of the results of inoculation in Surat?—No.

16,016. What is the result of your experience with regard to evacuation and residence in mandwahs?—As for evacuation and residence in mandwahs, personally I think that, where early information of plague cases can be obtained in order to ensure their early removal, evacuation is not necessary and is only a rough and ready method of getting at plague cases. As for residence in mandwahs, where the mandwahs are kept well scattered and the sick eliminated or isolated a good effect has been obtained, but where no supervision is exercised and the people allowed to crowd together and shut out ventilation, as in the case of the Surat unauthorised camps, I found the disease raged quite as freely in the mandwahs as it did in a town.

16,017. You speak of their early removal: will early removal of plague cases and contacts, that is to say,

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partial evacuation, stop the spread of plague within a town amongst the unevacuated people?—If you can get the cases early enough, I should think it would, because outside people have not time to visit them.

16,018. As plague spread so much in the unauthorised camps I presume your staff was not strong enough to see that the huts were put up at proper distances?—The unauthorised camps came to us: that is to say, they existed when we took up the ward system. Previous to that people were allowed to go anywhere they liked. When we introduced the ward system we did not take them under our control until we noticed that they infected the town. Then we put them under control, and immediately they came under control the disease died down.

16,019. (*The President.*) Upon what do you found your opinion that in the unauthorised camps, the ventilation being defective, the spread of plague was as great as in the houses in the town itself?—Because in January I found my ward being re-infected, and I made inquiries as to where the infection came from. I suspected the unauthorised camps, and I visited them. Afterwards Lieutenant Carey was put in charge.

16,020. You found your opinion upon the fact that the plague spread in these camps very badly?—Yes. We took special measures with reference to them.

16,021. Did Lieutenant Carey change the plan of the camps?—No, but he resorted to removal of the sick people, and segregation and isolation.

16,022. (*Dr. Ruffer.*) What is a mandwah?—It is a very light building of bamboo, with a slight thatch over it made of grass.

16,023. Can you give us any facts or figures showing the virulence of the disease in the mandwahs?—Lieutenant Carey had charge of them; the information would be in the Surat files. Lieutenant Carey was in charge subsequently, when we found the disease was bad in them.

16,024. Do you know anything about the mortality in the segregation camps outside the city?—No.

16,025. Your opinion is that there are circumstances in which evacuation as a plague measure is not necessary?—Yes.

16,026. You said that without evacuation plague can be prevented from spreading under certain circumstances: what are the circumstances to which you chiefly referred?—Getting the earliest information of cases.

16,027. Early information is therefore essential?—Yes, of cases, not of deaths.

16,028. The early information of the existence of plague is essential for the success of your efforts to stop the disease without evacuation?—Yes.

16,029. How would you modify the measures which are adopted here for obtaining information in order to obtain that information sufficiently early for your purpose?—By not segregating the neighbours if they gave early information.

16,030. You would trust to voluntary information?—Yes. The system here was that the people had to give information of sickness to us within 24 hours. They had to report all deaths to the police, who communicated with us. Therefore if a death occurred in the ward and it was not on our files as a case of sickness the neighbours on each side were removed. Therefore the neighbours, in order to avoid segregation, gave us early information of any sickness.

16,031. In fact, you created a penalty to meet the difficulty of not getting this information early enough? The neighbours were under the penalty of being evacuated if they did not give you the information?—The penalty came in in this way. If they assisted other people in the concealment of plague we had reason to believe that there was intercourse between those people, and therefore it was necessary to segregate them. They brought the penalty on themselves.

16,032. Did you find that effective as a means of getting early information?—Very effective. Out of 281 cases 230 were voluntarily reported.

16,033. With regard to the employment of Haffkine's fluid, I understand you have had information that it has sometimes produced disastrous effects in the hands of certain operators: what disastrous effects do you refer to?—Death from inoculation.

16,034. Have you any authenticated case in which death appeared to be due to inoculation?—I think you will get that information in Daman.

16,035. Who will give us that information?—Mr. Sorabji Manekji Damanwala.

16,036. (*Mr. Cumine.*) You say that in the month after the issue of the notification the disease was reduced to 50 per cent. in your ward?—Yes.

16,037. Was it reduced throughout the town at the same time?—We tried that notification in two wards, my ward and Mr. Mead's ward, for one month, and then it was subsequently circulated to the other offices.

16,038. But during the one month in which the notification produced a decrease of 50 per cent. in your ward, was there a similar reduction of 50 per cent. in other wards where the notification was not in force?—From the records in Gopipura, Sagrampura, Nanpura, and Syadpura, which were infected, there was no such marked decline.

16,039. Do you know what the reduction of population was during that month in your ward? Did the population fall 50 per cent. also?—No; we never had it less than 10,000 in our ward, and our ordinary population was 15,000.

16,040. Can you tell us by what proportion the population fell during the one month in which the cases fell 50 per cent.?—About a thousand perhaps.

16,041. What proportion?—Not 10 per cent.

16,042. You have no personal knowledge of the mandwahs? They were under Lieutenant Carey?—I visited them. I have personal knowledge from seeing cases in them.

16,043. Did infection appear to spread amongst the people in the mandwahs, or did it appear to be brought by visitors to the town and not to be passing from one mandwah to another?—From both sources.

16,044. Which was the most general source?—I could not say positively.

(Witness withdrew.)

(Adjourned till to-morrow.)

At The Castle, Surat.

FORTY-THIRD DAY.

Tuesday, 7th February 1899.

PRESENT:

MR. A. CUMINE (in the Chair.)
Dr. M. A. RUFFER.
Mr. C. J. HALLIFAX (*Secretary*).

Mr. H. M. JUDGE recalled and further examined.

Mr. H. M. Judge.

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16,045. (*The Chairman.*) You put in yesterday (see Question No. 16,009) a photograph of a chart showing how in your ward in Surat town the infection seemed to be carried by friends and relatives visiting sick patients. Would you explain the chart to us?—I have taken out the typical cases on another chart, which is more legible, and I put those in.* "A" is a typical one; he was a mason who was working at an infected place outside the town. We were late in discovering him, and the consequence was that these five people were subsequently found infected. By their depositions, we found that this woman in the house opposite there had attended on her uncle, Moti Ram, in his sickness. Vigli and two girls in another house opposite were relatives of his that had been taken across, and they subsequently took plague. Balu and Nandi had visited this Moti Ram in his sickness. They lived entirely in a different street. Nandi developed plague. Chani Lal had been visiting Nandi in this place and he died of plague. What I wish to point out is that supposing we had been able to catch this man Moti Ram early in his sickness, the probability is that these infections would have been prevented. That is one typical case. Then there is case "B." A woman named Rukhi in Kansara Seri was infected with plague before I took charge, so that I had nothing to do with her. The result of her not being discovered in time was that Dholi, who was an attendant on her got plague. Eight people got traced to this focus of infection. the following table is explanatory of the chart:—

* *See* App. No. LIV. in this Volume.

Date.	Name.	House No.	History.	Street.
23.10.97 -	Rukhi - - -	- - - -	Before I took charge - - - -	Kansara Seri.
4.11.97 -	Dholi Kansara - -	A. 4–4 -	Had been an attendant on Rukhi; sent with plague to C. H. about 13 days ago, before I took charge; at this time attendants getting leave from C. H. were not segregated at all, but allowed to return home.	Ghya Seri.
6.11.97 -	Dai Kansara - -	A. 11–70 -	Rukhi, her sister-in-law, residing in the same house as Dai, was sent to the H. H. about 15 days previously with plague.	Kansara Seri.
7.11.97 -	Lakhsmi Kansara - -	A. 11–49 -	Went and visited Dai Kansara, 8 H. H., during illness.	Kansara Seri.
8.11.97 -	Fakir Kansara -	A. 7–71 -	Father of Rukhi and visited her and attended her in hospital.	Kansara Seri.
10.11.97 -	Jamna Kansara - -	A. 11–77 -	Went as attendant on Lakhsmi Kansara 9 H. H., and then developed plague.	Kansara Seri.
12.11.97 -	Jadav Kansara - -	A. 11–148	Had been visiting her mother, Dai Kansara, 8 C. H., during her illness.	Thoba Seri.
21.12.97 -	Motiram Lakhsmidas -	B. 1–64 -	Used to work at Aswanikumar, and visit Rustambag Mandwad also; attended funeral, &c. of his relative, Thakor Keka, at Varucha Private Mandwah 25 days previous, was evidently ill some time, and on point of death when found.	Satimata Seri.
22.12.97 -	Gajri Tricum -	B. 1–50 -	Attended on her uncle, Motiram Kadia, C. H. 82, in his illness, &c., and visited him.	Satimata Seri.
24.12.97 -	Vigli Purshotam - -	B. 1–53 -	Was related to Motiram Kadia, C. H. 82, and visited him during his illness.	Satimata Seri.
24.12.97 -	Balu Makan - -	B. 1–53 -	This child and her mother lived in the same house as Motiram Kadia, C. H. 82; on his removal to hospital came to this house to evade segregation.	Satimata Seri.
27.12.97 -	Jadi Kansara - -	A. 4–377 -	Bai Jadav Kansara, 23 P. D., died on 12.11.97, and her relations were sent to quarantine; there Ambaram Harkishan developed plague, and was sent to C. H. about 7.12.97, and Jadi went to the funeral ceremonies and subsequently developed plague.	Kansara Seri.
29.12.97 -	Nandi Trebhovan - -	A. 12–100	Used to visit Motiram Lakhsmidas Kadia, C. H. 82, during his illness to inquire after him up to 21.12.97.	Rughnathpura Sadak
30.12.97 -	Balu Kasidas Kansara -	A. 11–35 -	This boy's father attended funeral ceremonies of Jadi Varajdas Kansara, 66 H. H., on 28.12.97.	Kansara Seri.
4.1.98 -	Harkor Kansora - -	A. 11–96 -	Had visited Balu Kasidas Kansara, 72 H. H., during his illness.	Thoba Seri.
11.1.98 -	Chanilal Pavachand -	B. 1–62 -	Used to visit Nandi Kadia, 71 H. H., during her illness; developed fever on the 9th, and concealed it.	Satimata Seri.

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16,046. (*Dr. Ruffer.*) Was Rukhi's a bubonic or pneumonic case?—Rukhi was before I took charge. Dholi, I think, was pneumonic.

16,047. Were the other cases traced to that patient, pneumonic or bubonic cases? It would be very important if you could trace that?—That would be on the hospital files. We send them with a printed note, in which we state whether, in our opinion, it is bubonic or pneumonic, and they settle the question in the hospital.

16,048. Will you trace those notes for us, and also give us any information you can about pneumonic cases getting plague from bubonic cases, or *vice versâ*;—that would be extremely useful?—Yes, I find that there were many bubonic cases and only a few cases recognized as pneumonic, and many cases of a virulent type of plague which died in the Plague Hospitals without developing bubo, and the following cases, all thoroughly authenticated, are on record, in which contact with a pneumonic case developed bubonic plague, and contacts with bubonic plague developed plague without bubo, viz.:

Date of Discovery.	——
15th November 1897 -	Bhagga Jiwan (pneumonic case).
16th November 1897 -	Ambi Lalu (contact of Bhagga Jiwan) developed bubonic plague.
27th December 1897 -	Jiva Ranchhod (Bhagga Jiwan's contact) developed bubonic plague.
6th February 1898 -	Harkishan Ghelabhai (pneumonic case)
26th February 1898 -	Mahalakhsmi Lalu (Harkishan's contact) developed bubonic plague.
6th November 1897 -	Dai Hargovan (bubonic).
7th November 1897 -	Lakhsmi Vajeram (Dai Hargovan's contact) developed pneumonic plague.

These are distinct cases *in re* pneumonic plague, but there remains a large number of persons who were admitted into hospital as suffering from plague, and from the hospital returns died from plague without discharging bubonic symptoms. If these are taken as a different type of plague to bubonic plague, the following results are found, *i.e.*, in the Hindu Hospital 20 persons died of plague without buboes; in the Muhammadan Hospital 3 persons died of plague without buboes; in the Civil Hospital 24 died without buboes. If these are taken as non-bubonic plague cases producing bubonic plague in contacts, and *vice versâ*, the following cases are found:—

Date of Discovery.	——
8th November 1897 -	Shivkor died in the Hindu Hospital of plague without developing bubo.
13th November 1897 -	Doolabhram Gopaldas (Shivkor's contact) developed bubonic plague and was sent to the Civil Hospital on 13th November 1897.
19th December 1897 -	Itcharam Bimaram (Doolabhram's contact) developed plague and died in hospital without developing bubo.
10th November 1897 -	Harkishan Doolab found dead from bubonic plague.
10th November 1897 -	Mosan Kallian (Harkishan's contact) developed bubonic plague and was sent to the Civil Hospital on 10th November.
16th November 1897 -	Varajdas Fakirchand (Harkishan's contact) died of plague without developing bubo in the Hindu Hospital.
4th November 1897 -	Pali Hargovan (bubonic plague).
18th November 1897 -	Suraj Girjashankar (Pali's contact) died of plague in the Hindu Hospital without developing bubo.
3rd November 1897 -	Naval Mulchand (bubonic case).
21st November 1897 -	Kashi Lalubhai (Naval's contact) died of plague in the Hindu Hospital without developing bubo.
2nd December 1897 -	Jeskor Motiram (Kashi's contact) died of plague in the Hindu Hospital without developing buboes.
8th December 1897 -	Dwali Dhaichand (pneumonic case).
14th December 1897 -	Ratna Dhanji (Dwali's contact) died in the Hindu Hospital without developing bubo.
18th December 1897 -	Daya Amtha (bubonic case).
25th December 1897 -	Dai Hargovan (Daya's contact) died in the Hindu Hospital of plague without bubo.
24th December 1897 -	Reva Jiva (bubonic case).
28th December 1897 -	Lakhi Lala (Reva's contact) died of plague in the Hindu Hospital without developing bubo.
2nd January 1898 -	Hansa Bibi (bubonic case).
14th January 1898 -	Mahomni Begam (Hausa's contact) died of plague in the Muhammadan Hospital without developing bubo.
6th November 1897 -	Nani Bhagwandas (bubonic case).
6th November 1897 -	Lala Sankar (Nani's contact) died in the Civil Hospital without developing bubo.
9th January 1898 -	Chhagan Ranchhod (bubonic case).
19th January 1898 -	Ramji Gigar (Chhagan's contact) died of plague in the Civil Hospital without developing bubo.

16,049. (*The Chairman.*) Could you trace all the cases of infection in your ward to visits to sick people, or was there a balance of cases left that you could not explain in that way?—I did not attempt to take all the depositions, but all that I took were traceable. I gave over charge of them before I finished my inquiries. There were a certain number of cases left over which were not inquired into. I had to go to my own duties.

16,050. How many cases did you trace to your own satisfaction? I think you said yesterday that you had about 200 depositions. But I do not recollect your mentioning the number of cases; and you might have three or four depositions about one case?—There were 200 separate cases.

(Witness withdrew.)

K. B. Dosabhai Pestonjee.

KHAN BAHADUR DOSABHAI PESTONJEE called and examined.

16,051. (*Dr. Ruffer.*) You are a retired Assistant Surgeon?—Yes.

16,052. During the plague you were on duty in the city of Surat?—I was appointed honorary Personal Assistant to Mr. Mead, who is now at Ahmedabad.

16,053. How do you think was the plague brought into Surat?—It was imported into Surat from Bombay.

16,054. Were you able to trace the first case which came from Bombay?—The first case came under my observation on the 17th October 1896. This case was reported to me, I believe, by one of the Sanitary Inspectors. I saw the patient. He was residing at Begumpura, and was one of the servants of Mr. Moolaji, and had just returned from Bombay. The next case was on the 8th December, six weeks after this.

16,055. Were you able to show any communication between the first and the second?—None whatever, because they resided in different localities.

16,056. So that it may have been a case or re-infection?—It most probably was an indigenous case.

16,057. Where do you think the indigenous case got the disease from?—There might be some communication, because they were both Muhammadans.

16,058. But six weeks had elapsed?—Yes.

16,059. It is difficult to believe that this case got the disease from the other?—I am not in a position to account for it.

16,060. Then a Parsee lady got plague?—Yes. She was residing with her husband, and she died after three days. Afterwards her husband had to go to Bulsar for

the benefit of his health; there he contracted the disease and died.

16,061. By what means do you think was the disease spread in the city?—My opinion is that plague in Surat was communicated by human communication.

16,062. Do you think the rats had anything to do with it?—Yes, they have also, but, as far as my observation goes in the city of Surat, I do not think the rats have had much to do with it.

16,063. When you have been able to trace a case of plague have you generally found there had been human communication?—Yes, in most of the cases which came under my observation. I found very few dead rats in my locality.

16,064. Can you give us any examples in which you could clearly trace several cases of plague to one patient?—I have brought a map* with me showing it was entirely owing to human intercourse that plague spread in the city. The plague was very bad in Hathifalia Street inhabited by Golas, or rice-beaters. Although this street was closely contiguous to the street called Kharadi Sari, inhabited by artisans, Kharadi Sari had very few cases, in fact, only two or three. I wish to point out that it spread by human intercourse, because Hathifalia is at a longer distance from the other streets which were also badly infected, the reason being that the inhabitants of Hathifalia belonged to the same caste as the Golas. Those people were in the habit of running away from Hathifalia Street into those other streets, which, although they were situated at a greater distance, were badly infected.

16,065. Did you notice that the Golas suffered specially from plague?—They suffered mostly from plague.

16,066. Why?—On account of being of the same caste. The Golas did suffer because they ran away from one house to another and took shelter in the houses of their friends and relations. They suffered more than the other class of people.

16,067. Do you not think that might have been due to their occupation. Do they wear shoes, for instance?—No. The Golas, or rice-beaters by the very nature of their profession are constantly engaged in beating the rice bare-footed, and standing on a damp and wet soil.

16,068. Are you of opinion that plague may be contracted by absorption of the plague bacillus through fissures and cracks in the interspaces between the fingers?—Yes, but the bacillus must have been conveyed there by other infected people.

16,069. And from any open wound into other parts of the body?—Yes.

16,070. Do you think the wind has much to do with it?—No.

16,071. Will you kindly give us your opinion about that?—I am of opinion that the direction of the prevailing wind has no influence in carrying the poison from one locality to another: and this point was carefully marked by me during the prevalence of the epidemic in my ward. In addition to the Golas, Ghanchis, and weavers in my ward, there were about 200 houses belonging to the Borahs. These houses were lofty buildings consisting of three or four storeys, and although the quarter was closely surrounded on the east and west by infected streets, the Borahs escaped the disease altogether.

16,072. How do you account for that?—Because the houses were loftier; there was plenty of light there, and they had no human intercourse, at least with those people. They would not allow them to enter their houses.

16,073. Do you think that plague may recur in a disinfected house?—Yes. There were several instances in which, although the houses were washed clean, plague did occur.

16,074. In these cases can you prove the patients did not get the plague from some other plague patient in the town?—I am not in a position to prove that.

16,075. Do you think the immediate evacuation of an infected street is a useful measure?—Yes. I am of opinion that complete evacuation is much more beneficial than partial evacuation.

16,076. Do you believe that complete evacuation of a large town is possible?—It is not possible.

16,077. Could you evacuate a street during the rainy season?—Not during the rainy season; it would be very inconvenient to remove the people. If they have got proper shelters and so on, it might be advantageous to remove them if the plague is very bad in the street.

16,078. Do not you think people would suffer a good deal by being turned out during the rainy season?—The shelter must be of good character, so as to prevent them being exposed to wet and cold.

16,079. Do you think you could get such shelters? Do you think it would be possible to evacuate a street of 2,000 inhabitants and find shelter for the people?—No. It is not possible, of course, financially

16,080. So that during a certain period of the year evacuation could not be carried out?—That is so.

16,081. Do you think segregation should be applied strictly and rigorously on the appearance of a plague case in a house?—Yes, the people must be told to go away.

16,082. At once?—They must be allowed some time, of course.

16,083. Is not there a great chance of a certain number of people getting off?—Yes.

16,084. Then what is the use of segregating the others?—We only segregate those people whose houses are infected; the other people are told to go away into health camps.

16,085. Supposing you have a case of plague in a house inhabited by 50 people, and you allowed them four or five hours to make their arrangements, would you find 50 people in that house on your return, or would the majority have escaped?—I do not think a very long time should be given, but they must have some reasonable time in which to prepare themselves.

16,086. Do you think a certain number of people would escape in any case?—Yes.

16,087. A large or small number?—A certain number would escape, even if they are allowed to remain for five or six hours.

16,088. Supposing you have 50 people in a house, do you think five will escape, or 45?—I believe nearly half will escape.

16,089. Do you think it is much use segregating the other half?—Yes.

16,090. What is your opinion with regard to the treatment of plague patients in Government or private hospitals?—My opinion is that patients prefer to go into caste hospitals, and they should not be compelled to go to Government hospitals.

16,091. You say in your précis of evidence that in the Hindu Hospital there were 1,205 admissions out of 2,264 plague cases which occurred in the city; what do you mean by that?—That is a mistake. I mean there were 2,264 patients admitted into the Hindu Hospital, of which 1,205 proved fatal.

16,092. Have you any evidence as to the value of prophylactic inoculation?—No, because I have not performed any inoculations.

16,093. Have you seen anything of it?—Not in the city of Surat.

16,094. Do you think it has a value besides its prophylactic value?—Yes, I am a great advocate of inoculation.

16,095. Why?—From the statistics which have been furnished me.

16,096. Leaving out the statistics, do you think inoculation has a pacifying effect on the minds of the people and prevents them running away?—Yes; if a man is inoculated he thinks he is comparatively immune for a certain period, and consequently he is relieved of all anxiety from fear and fright, and that is the great point during the prevalence of an epidemic.

16,097. (*Chairman.*) You say in your précis that the epidemic became confirmed in June. Were there any cases reported in June 1897?—There were sporadic cases before that, but it became confirmed in the months of August and September, 1897.

16,098. Were any cases reported in the month of June?—Yes, there were one or two cases reported. I have the statistics showing how many case of plague occurred.

16,099. Dr. Nariman told us there was no case between the 11th May and the 4th July, 1897, a period of 54 days, and that it was believed the epidemic was completely stamped out. Have you made a mistake?—On the 1st June 1897 there was one case of plague.

* Not published with the Proceedings of the Commission.

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16,100. Did you see it?—No.

16,101. Who did see it?—The Sanitary Superintendent. I got these figures from him.

16,102. Did you see any cases of plague in Surat after June 1897?—Yes; at that time, *i.e.* in September 1897, I was on a search party visiting from house to house.

(Witness withdrew.)

Mr. A. S. Jervis.

Mr. A. S. JERVIS called and examined.

16,103. (*The Chairman.*) Have you had experience of plague in Surat?—Yes.

16,104. At what time?—From about August 1897 till the present time. I am still on plague duty.

16,105. What is your post in the plague establishment?—I was, first of all, a Ward Superintendent. Before that I was engaged in house to house searching before the Ward Superintendent system came into vogue. After it came into vogue I was Ward Superintendent, and now I am chairman of the Vigilance Committee.

16,106. You are not a Government official, are you? You are a private individual?—Yes.

16,107. Amongst whom did the plague get its firmest hold?—In my ward, among the Golas.

16,108. Do you know any particular reason for them being specially affected?—I think it was due particularly to the insanitary state of their dwellings and the place in which they were engaged. Although these Golas are originally rice-pounders, yet they are engaged in rag-selling and rag-picking, and they deal in old account books, and all kinds of dirty rubbish which they can pick up. I think perhaps that had something to do with it. The houses these people lived in were of a very bad sort, over-crowded, ill-ventilated, insanitary, almost without light and air.

16,109. Next to the Golas, who were the people who suffered the most, the poorer or the richer classes?—The poorer.

16,110. What sort of houses did they live in?—Houses such as I have described.

16,111. Have you any facts to show us what the efficiency of disinfection with perchloride of mercury is?—No, I have no facts to show you what the efficiency is, but I have facts to show where, after the re-occupation of such houses, which had been thoroughly disinfected and whitewashed, plague broke out again.

16,112. Might not there have been fresh infection?—Hardly. There was no case amongst the people where they were living in the segregation and health camps.

16,113. But when they came back to the town they might have got the infection from some other person, might they not?—It was hardly possible, I think, because the cases occurred not very long after re-occupation.

16,114. How does that show they did not get it from some other person?—I do not think they had time or opportunity of going to other places in the city where the plague was.

16,115. What was there to prevent it?—Probably their own fear of the plague, and they knew we did not allow intercourse, as far as possible.

16,116. How did you prevent intercourse?—The orders were strict; that is about all. If anybody was caught going into an infected locality he was sent back to the segregation camp, health camp, or quarantine camp, which was our mode of punishment. If any man disobeyed our orders he had to go into one of those camps, according to the enormity of the offence.

16,117. Do you know of any bad results from dipping clothing into perchloride of mercury?—I have heard of two cases, which a doctor in the city reported to me, of mercurial poisoning which occurred through the wearing of clothing which had thus been disinfected.

16,118. It is not within your own knowledge?—No.

16,119. What is the result of evacuation, so far as you have seen?—So far as I have seen the results of evacuation are good. I know of one locality in my ward in which, after two plague cases had occurred, the people were all turned out into a camp in the open country, and no more cases occurred amongst those people. Only the houses in which the plague cases actually occurred were disinfected with perchloride of mercury, but all the other houses, about 40 in number, were opened up to the light and air and were thoroughly cleaned and whitewashed. No more plague cases occurred amongst these people after re-occupation.

16,120. (*Dr. Ruffer.*) What were the symptoms of mercurial poisoning described to you?—Salivation, inflammation of the gums, and fœtid breath.

16,121. Loosening of the teeth?—Yes.

16,122. Diarrhœa?—No; the doctor did not mention diarrhœa.

16,123. Did the patients lose their hair?—No, I do not think so.

16,124. How long did the symptoms last?—About 15 days. They were under treatment about 15 days.

16,125. Did they recover?—They both recovered.

16,126. How did these people get poisoned? You say from wearing clothes?—From putting on clothes after they had been disinfected. Both of these cases were being released from the health camp, and it was a rule in the health camp to disinfect all the clothing before the persons were allowed to go away.

16,127. Had their houses been disinfected?—Yes, previously.

16,128. With perchloride of mercury?—Yes.

16,129. How do you know they did not get it from the houses?—The houses had been disinfected many days before, and they had been whitewashed by the Ward Superintendents. One of these men, a mason, resided in my own ward.

16,130. Had their houses been disinfected with perchloride of mercury and then whitewashed over all the surface which had been disinfected?—Yes.

16,131. Do you know whether these people had any sores on their bodies?—Not that I know of.

16,132. Had either of them had a perchloride bath?—Both of them had a perchloride bath as well.

(Witness withdrew.)

Mr. H. N. Haridas.

Mr. HARDEVRAM NANABHAI HARIDAS called and examined.

16,133. (*The Chairman.*) You are one of the Municipal Commissioners for Surat?—Yes.

16,134. And a barrister-at-law?—Yes.

16,135. And the Honorary Secretary of the Hindu Plague Hospital at Surat?—Yes.

16,136. You are, I think, a non-official, a voluntary witness?—I am a non-official witness. I do not understand what you mean by a voluntary witness. I am not a voluntary witness, because I was asked by the Collector if I was willing to give evidence before you. But for such a request I should never have come before the Commission. I have written to the Commission on this subject, and they may decide whether I am a voluntary witness. I do not think I am.

16,137. I understand you wish to give us some facts with regard to the system in force before October or November 1897 for the prevention of plague and the treatment of plague patients?—In the first place, before October 1897 the only measures adopted were, first, house-to-house searches by the Municipal Commissioners, who had given their services for the purpose; and, secondly, the disinfection of houses with a solution of perchloride of mercury. With the exception of these two, there was no regular system for the prevention of plague at all in the city, neither of medical examination at the station, nor was there any system of ascertaining the number of arrivals, or of seeing how many of those arrivals came in with plague and how many of them got the plague after coming

into Surat. There is a total absence of any reliable statistics on that point. So that we are not in a position now to say how the plague was introduced into Surat at all. On the contrary we have some grounds to believe that it was not the coming in of the people that brought the plague. The greatest influx of people into Surat was between the months of October 1896 and March 1897. About 20,000 or 30,000 people came in during that interval. During that interval not a single case was detected amongst those who came in contact with the new arrivals. I learned from newspaper reports that between the months of October 1896 and June 1897 110 plague cases were found. I explain those in this way. There were about 20,000 arrivals, and 110 attacks on 20,000 arrivals represents something like ½ per cent. My theory on that point is this: we have to go on theory, because we have no proper statistics, and I have been refused permission to examine even the very poor statistics which have been recorded. Therefore I have to give theories on that point. My theory is that they were cases imported from Bombay. Either they were plague cases when they came or were in the period of incubation. It is only ½ per cent. of the arrivals. The other thing which struck me most was this, that most of the arrivals were the richest classes, for instance, what we call Jauharis (pearl merchants). I lived in the street to which these Jauharis came, and during all the four months there was a total absence of plague in my locality. Therefore, if the Bombay people could bring plague into any part of the city it must have been in that part of the city which was for four months inhabited by the Jauharis. This negative hypothesis has no parallel positive hypothesis to prove plague was imported from Bombay. In the beginning of May all these new-comers went out from Surat to Bombay again. There was no plague in Bombay, so they all returned to Bombay, and the plague took a firm hold in Surat at the end of July. On these grounds, I do not think that the plague started here on account of allowing people to come in without any land quarantine or surveillance. On those grounds I also believe the plague was not communicated into Surat from other places, but it became infected. As I proceed with my evidence, I will also state the grounds on which I base my argument that the plague is not communicable from person to person. With regard to the measures the only persistent measure was flushing of the houses through Municipal fire-engines. I think that was an objectionable thing, because the Municipal fire-engines had metallic tubes—brass tubes —most of them, and even if we suppose that the solution of perchloride of mercury would do any good in preventing the plague, flushing the houses through the fire-engines would deprive the solution of its chemical properties. I am afraid the mercury would be absorbed in the brass and other metals, and the solution which came out and flushed the houses would not retain the chemical properties of perchloride of mercury. This system went on till nearly the end of October. Until Sir Andrew Wingate visited here, that was the only thing done, flushing the houses through Municipal fire-engines. The flushing was done in a very objectionable manner also; it was left entirely in the hands of Municipal underlings, who perhaps had no idea why the flushing was required. They drenched the houses, and as most of the houses were of mud floors, the result was, they were made uninhabitable altogether, on account of the damp consequent on the disinfection. There was another thing which was most objectionable. I think if the houses were so disinfected, the inmates of the houses should have been told to go out for two or three days or two or three weeks, but they were all allowed to live in the houses. While one part of the house was being flushed the inmates were removed to another part, and then the flushing was continued in another part of the house, and no one was removed at all. The people were living in those damp uninhabitable houses. I think that objectionable system of flushing is to a certain extent responsible for plague in the city; it served as a predisposing cause to bring the plague. Nothing was done until November. Instances have come to my knowledge where houses have been disinfected and case after case of plague has occurred afterwards. It was not only the houses in which plague occurred which were disinfected, but also one house on each side. When one case of plague occurred, three houses were disinfected and made damp. Of course people do not like this sort of disinfection, and they were afraid in case plague cases were reported, their houses would be flushed, and this, to some extent, explains why there was concealment of cases before a better system was adopted. In September and October there was a regular exodus from Surat. It was in October that the Mahajans, that is, the leading citizens of Surat, thought of opening a caste hospital. The necessity was this: between August and October there was no private hospital accommodation at all for the segregation of the sick. If plague cases were found they were taken to the Dharamsala, that is a place for travellers, The Dharamsala was twice as big as this room, I should think, and in that Dharamsala all the sick were segregated. Some of my friends visited the Dharamsala with me and saw in what state the patients were. We saw one patient dying, and another patient a little distance away, about a yard, in a state of semi-delirium; a third patient having his food just near, and a fourth patient passing stools. We thought that was a very objectionable system of segregation, and then we appealed to the Mahajans, and they allowed us to open a hospital. That system was in vogue till His Excellency Lord Sandhurst came to Surat on the 18th October. Then a proper system was provided, but even that was not so acceptable from a popular standpoint as the system adopted in my hospital. I will tell you the system we adopted in our Hindu Hospital. Whenever a patient was segregated we allowed two relations to stay with him. We found them food and lodging, and in a great many cases clothing and bedding and medical treatment all free. We found even for the relations of the patients, everything that they would require to make them comfortable there. The management was entirely in our hands, that is, in the hands of a committee appointed by a public meeting in Surat, and the hospital was managed entirely by private contributions. A Vaidia, that is, a practitioner who practised native medicine—not an English doctor —who had some reputation in Bulsar for curing plague cases, volunteered his services, and on account of his reputation, and the fact that the management was not Sarkari, that is, was not official, people flocked in of their own accord without the intervention of any search parties or officials at all. I think within the first fortnight we had something like 100 cases in the hospital. Before the Hindu Plague Hospital was opened there was a continued cry of "concealment of cases." The concealment of cases I attribute to three causes, first, fear of their houses being disinfected, second, want of proper accommodation in the official hospital as it then was, and third, ignorance amongst the people of the real nature and symptoms of plague. I do not call the last cases cases of concealment at all, they were rather cases in which plague was not reported on account of ignorance. Those people who did not segregate their sick relations to the hospital on account of the fear of disinfection were rather unwilling at first to come to us, but when they found they would all be comfortable in the hospital, and that there was an asylum for two relations in the hospital they came in. The other inducement to them was, that their caste prejudices were observed. There are several castes among the Hindus, and we made arrangements with regard to cooking and so on, so that no caste prejudices were affected. The opening of this Plague Hospital by the Hindus put a stop to the concealment of cases in two or three weeks, and the rush was so great upon us, that within three or four weeks of the opening of the hospital, we had to erect new sheds to accommodate more patients. The then Collector issued a notification, about the beginning of November, that those people who concealed their cases would be forced to go to the Government Hospitals, and those who gave notice of the plague cases would be sent to the Castes' Hospitals. Of course, people regarded it as a punishment to be sent to the Government Hospital. The death rate in Surat was highest on the 18th October 1897, when His Excellency was amongst us; it was 63 or 65. At that time, there was no proper hospital arrangement at all. The only hospital arrangement was the Parakh Dharamsala and our hospital. Sir Andrew Wingate arrived amongst us about the beginning of November 1897, and he introduced a new system. According to Sir Andrew Wingate's system, the city was divided into wards, and the Ward Superintendents had to segregate the sick into the hospitals, then disinfect the houses and segregate the contacts and keep a strict eye on new arrivals. The other measure introduced was a sort of land quarantine at the railway station. People had very little objection to evacuation. They were going away themselves, but what they objected to was being forced to go into certain localities which the plague authorities pointed

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out. They wished to go into the fields without any interference. They would not object to some slight supervision. I am afraid there was no proper inspection of the sick before they were sent to our hospitals.

16,138. Do you mean you know there was not?—Yes. I met with two or three instances which were sent to my own hospital, in which the cases which were sent had no plague or anything of the sort at all; and we had to return them. In one case the doctor certified the temperature of the person whom he sent to us as being more than 101. When the patient arrived I was there myself (because at that time I was spending 12 or 15 hours a day in the hospital). We used the thermometer, and found the temperature was normal. The doctor who had segregated the patient followed the patient, and we asked him to examine the patient again. He used his own thermometer, and found the temperature was 98·4, the normal temperature. He said he had examined him only half-an-hour before, and the temperature was over 101. We carefully examined the patient, but he did not show any plague symptoms at all.

16,139. (*Dr. Ruffer.*) Did that patient die?—I do not know that; he never returned to us.

16,140. (*The Chairman.*) You cannot say of your own knowledge, can you, that his temperature was not 101 at the time he was first examined?—No, but the temperature cannot fall 3 degrees in half-an-hour.

16,141. (*Dr. Ruffer.*) Why not?—It is so unusual in plague.

16,142. What evidence have you of that?—Lots of evidence on the record.

16,143. Have you ever taken a plague temperature yourself?—Often.

16,144. Will you kindly tell us what is the highest temperature in plague?—106.

16,145. Did you ever take the temperature half-an-hour afterwards?—Yes.

16,146. What was it afterwards?—Just the same.

16,147. Then another half-hour?—In the case in which the temperature was 106 I did not notice a fall for nearly two or three hours, and the patient died.

16,148. You have never seen a temperature fall 3 degrees in half-an-hour?—Never. Now I come to the question of detention-camps and surveyance on the station. I myself am against land quarantine.

16,149. (*The Chairman.*) Can you give us any facts which would show that the system either checked or spread plague?—It did neither. Now I will give some facts from my observations in the hospital as to why I do not believe in the theory of infection from person to person. I had in the hospital between October 1897 and the end of January 1898 something like 1200 relations staying with the patients. Amongst those 1200 we had only 19 cases of plague. Out of these 19 cases three or four happened during the period of incubation. The ratio dwindled down to 1 per cent., and that occurred amongst the lowest classes on account of carelessness in nursing. The treatment adopted in our hospital was to raise something like a blister on the bubo, and the matter came out; and the dirtiest people, not being very careful nurses, caught the plague from their own people. If infection from person to person was a sound theory, out of these 1,200 people at least 120 would have been attacked. These were the people who lived in the hospital with the patients, but there were a good many relations who came to see them, and remained part of the day, and consequently at Dr. Nariman's suggestion we had to put up a notice board restricting the hours of visitation. None of those people came either to our hospital nor did they go to any hospital at all. That is one reason why I believe infection from person to person is not a cause of plague at all, but that the soil is infected. In support of that I have another illustration that I can supply to you from my experience in the hospital. In February 1898, we had heavy rains and the locality in which the hospital was situated became infected. There was an actual plague case immediately in the neighbourhood of our hospital, and from that day the number of attacks in the relations began to increase and between the 9th February and the end of March we had something like 34 attacks in the hospital. The first attack in the hospital staff was that of a servant who did no hospital duty. He was a storekeeper, and simply weighed grain and gave materials to the kitchen. He had nothing to do with the treatment of the patients and never came in contact with them at all. Our hospital office was outside the hospital where the patients were kept. The first case took place in our store-room, which was the darkest room in the building, and the servant was sleeping in the same room. The second case of infection also was the case of a servant girl, an outside servant.

16,150. We have had a great deal of evidence from other people on this point. I can give a great many more illustrations from my hospital statistics that there was no infection from person to person until the locality in which the hospital was situated became infected. For those reasons I thought that detention camps and surveillance at the station were as good as nothing.

16,151. Have you any facts to prove that?—From my hospital experience. If the ratio was only 1 in 1,200 we could scarcely have any cases.

16,152. But your experience was in a hospital and not in a detention camp.—Yes, it was in a hospital; it was the centre of plague. Now I come to the methods of disinfection adopted. Three modes were adopted, one, by the solution of perchloride of mercury; two, letting in light; and three, burning. Owing to the way in which the light was let in a good many buildings suffered needlessly.

16,153. What effect had that fact upon the plague germs?—I approve of light and air, but I disapprove of the system adopted. I hold that the letting in of light has prevented plague.

16,154. We cannot go into the question of whether the buildings were damaged more than was necessary in the letting in light.—The other process of disinfection was burning. I do not think that burning did much good from my experience in the hospital.

16,155. Why not?—Because no appreciable results were seen upon the health of the patients. We burnt all the bedding and everything the attendants had, and the ratio of death for nearly three or four months continued the same. Burning could not be conducted very efficiently because certain things had to be exempted—the precious things. If burning was an efficient method of disinfection the exemption of certain things would make it inefficient.

16,156. That does not show, does it, that burning was not effective in the articles which were burnt?—It does, as far as the hospital was concerned, because in spite of burning every little thing there was no effect upon the health of the people or in the ratio of the attacks. After burning was put a stop to to a certain extent, the cases improved a little bit. I do not think there is any connection between burning and the health of the patients.

(Witness withdrew.)

Khan Bahadur P. H. Dadachanji.

KHAN BAHADUR P. H. DADACHANJI called and examined.

16,157. (*Dr. Ruffer.*) You are Assistant Surgeon at Bulsar?—Yes.

16,158. You have been in charge of plague operations there?—I was in charge of the plague operations in the second epidemic. In the first epidemic Dr. Dyson was in charge.

16,159. When did the epidemic of 1898 begin?—On the 25th of April 1898.

16,160. How did the disease come to Bulsar?—One of the Dhebras, dry fish sellers, had been to Billimora on a wedding party. They returned about the first or second of the month to Bulsar. The fact of their having gone to Billimora was not known to us. Immediately after their return one death occurred among them. The sickness was not reported, but on the occurrence of the death, an application was made for the removal of the body. The body was examined, there were no buboes, and the symptoms described were diarrhœa and vomiting. At the time, some cases of diarrhœa and vomiting had occurred in the town, and the Hospital Assistant put it down as a case of choleraic diarrhœa. On the 25th the Dhebras were attacked with plague.

16,161. When did the first case die?—He died on the 6th April 1898.

16,162. Did you have any cases after the 6th April 1898 until the other case?—No, none.

16,163. That makes a very long incubation period—20 days, does it not?—Yes, 20 days; but it does not necessarily make an incubation period. It is just likely that the rats were infected, and that they conveyed the disease to the other houses.

16,164. Had you any evidence that rats were infected?—Yes. Rats had been dying in the locality about a week before the occurrence of the second case.

16,165. Had you a cordon round the place?—No, no cordon.

16,166. How did you ascertain at the time that there was no plague in the town?—From the mortality in the town. The town was very healthy. The ordinary mortality for the five years in which there was no plague—between 1892 and 1896—was 29 per thousand. All along, the mortality was under the average.

16,167. Supposing there had been one or two cases of plague, it would not have raised your mortality very much, would it? What is the average mortality for a week in Bulsar?—On an average one a day.

16,168. That is seven a week?—Yes.

16,169. Supposing you had one or two cases of plague every week, do you think it would have attracted your attention?—Yes, it would have, as no dead bodies were allowed to be taken away without examination. If a case occurred and recovered it is likely that the authorities might not know of the occurrence of the case, but if the person died the authorities would come to know of it, because no bodies were allowed to be disposed of, without a pass being granted for the removal of the body.

16,170. Did you see all the bodies?—As many as I could; but there is a Hospital Assistant who goes about and sees the bodies.

16,171. Did he then see all the bodies before they were buried?—If the sickness was not reported beforehand the dead body was bound to be seen.

16,172. If the sickness was reported before death, did the Hospital Assistant see the dead bodies, or not?—If the sickness was reported before death the patient was examined during life, and there was no necessity to see the dead body afterwards.

16,173. From the 5th to the 25th of April, were there any deaths from bronchitis or pneumonia?—No.

16,174. What were the deaths that occurred during that time?—There was one from diarrhœa, three from debility, one from ascites following cirrhosis of the liver, two deaths from infantile wasting, one death from plague which was imported on the 20th, and one death among children under one month old.

16,175. Is it impossible that this woman infected herself from the case of plague imported on the 20th?—It is quite impossible. There was not the slightest chance of such an occurrence. The fact that the plague occurred in the locality in which the boy's case occurred on the 6th, and that dead rats had been found in that locality, subsequently, makes me believe that the infection originated from that boy's case.

16,176. You say that dead rats were found a week before the 25th?—Yes.

16,177. There must have been a considerable epidemic among rats before the mortality was noticed?—Very probably.

16,178. May there not have been cases of plague among human beings long before that?—As I say, if any cases recovered, probably we did not know of their occurrence, but no deaths escaped us.

16,179. Can you tell me how the disease spread from Dheberwad to Taiwad?—On the 6th May, 1898, the first case of plague in the street next to Dheberwad occurred. This street is known as Taiwad and its inhabitants who are Muhammadans are known as Tais (weavers). These Tais and Dhebras are altogether different communities. The former are Muhammadans, the latter Hindus. They have no business connections with each other. Their habits and customs are altogether different. The Dhebras were out of the town from 26th April to 12th May. Their first known case occurred in the town, the rest occurred in their camp about a third of a mile from their houses. So, as far as human agency was concerned, there was not the slightest chance of the conveyance of the infection from one place to another, and still the infection travelled to the adjoining street of the Tais, situated to the north of Dheberwad, showing that some agency other than human was at work in disseminating the disease, and that agency, as far as it is known at present, is that of rats, which none of our plague measures has been able to control.

16,180. Did you find any dead rats in Muhammadan houses?—Yes.

16,181. Do Hindus and Muhammadans employ servants?—They have got what are called Dhodia servants, an altogether different community from the Dhebras The Dhodias are a forest tribe of low caste Hindus.

16,182. Could not the servants of the Hindus have communicated plague to the servants of the Muhammadans?—No. The Hindus were all out of the town, they were completely isolated, and they have no servants.

16,183. Surely the Hindus and Muhammadans must have met in the street, if they met nowhere else?—The Dhebras were not allowed to come to the town for ten days.

16,184. But before they went into camp, must there not have been communication in the streets;—one street is not absolutely cut off from another one in a town?—Probably there was.

16,185. If there was communication, how could you say that human agency was certainly not a means of propagating disease in this case?—Look at the time which elapsed between the cases. The first case among the Dhebras occurred on the 25th, while the first case among the Muhammadans occurred on the 6th of May.

16,186. That is 11 days. Could not the Hindus have sold, or got rid of, infected clothes?—No, they are a very poor lot and they have nothing to sell.

16,187. Could not the servants, for instance, have taken clothes away?—No.

16,188. Why not?—The Hindu Dhebras have no servants and have nothing to sell, they have scarcely rags to put upon themselves. They are a poor community, and have nothing to sell in the shape of clothes.

16,189. Your opinion that the disease was communicated by rats is founded on the fact that you do not know of any other means of communication?—Yes, and the fact that rats had been dying in the locality before human beings were attacked.

16,190. Could you tell us whether you have ever seen the disease spread from the town to a village in its neighbourhood through the migration of infected rats?—The village of Bhagda Khurd, which is about three-quarters of a mile distant from Bulsar, affords an instance of a town infecting the villages in its neighbourhood through migrating rats. It appears that the infected rats from Dheberwad went in the direction of Taiwad more than in any other direction.

16,191. How was that ascertained?—Because the disease travelled to that side and nowhere else on the other side of the town.

16,192. Do you think the rats travelled in that direction?—Dheberwad is surrounded by different streets—on one side is Taiwad and on the other side is Ghanchiwad and for nearly a month Ghanchiwad was not affected at all.

16,193. I want to know how you ascertained that the rats travelled that way?—Because we did not find cases of plague in Ghanchiwad though that street was as much distant from the originally infected street as Taiwad, the street on the other side.

16,194. It simply shows that the plague travelled that way, but not the rats?—As we eliminate all other agencies for the conveyance of plague, we naturally come to the conclusion that it was conveyed by rats, who were found to be dying in large numbers in Taiwad.

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16,195. How do you eliminate human agency?—I told you before that there was no communication of any sort between these two communities which were first infected.

16,196. Do you mean to say that the people from Dheberwad never go to Bhagda at all?—No. As long as there was plague among them they were not allowed to move out of camp at all.

16,197. Was everybody evacuated?—The whole community, consisting of more than 200 persons, was turned out.

16,198. What other evidence have you got to show that the disease was spread by the migration of infected rats?—In the village of Bhagda the first case occurred on the 30th May, and about a week before that it was reported that rats had been dying there. At that time the disease had not become general in the town of Bulsar.

16,199. Who examined the corpses at Bhagda?—The Hospital Assistant.

16,200. All corpses?—Not all.

16,201. How do you know that there was no plague in the village of Bhagda?—I had to depend upon the report of the Mamlatdar.

16,202. Do you think he could diagnose a case of plague pneumonia?—No, certainly not.

16,203. Then you got several cases of plague in Bhagda after the great mortality among rats?—That is so.

16,204. Can you tell me whether the disease can also be spread by visits to infected houses?—Human agency also plays an important part in the dissemination of plague. Thus a person, from a healthy locality, visits an infected house to see a sick relative or to attend a funeral, becomes infected himself, falls ill in his own house, and starts a centre of infection. This is well seen in streets having a mixed population of different communities.

16,205. Had these communities anything to do with one another?—No.

16,206. After a time it spread to the other communities?—After a time it did.

16,207. In the first instance you told us that the Hindus could not have spread the disease to the Muhammadans because they had not any communication?—These are cases of streets with a mixed population where the people were all living in the street.

16,208. But it spread from one community to the other in spite of there being no communication apparently?—That is so.

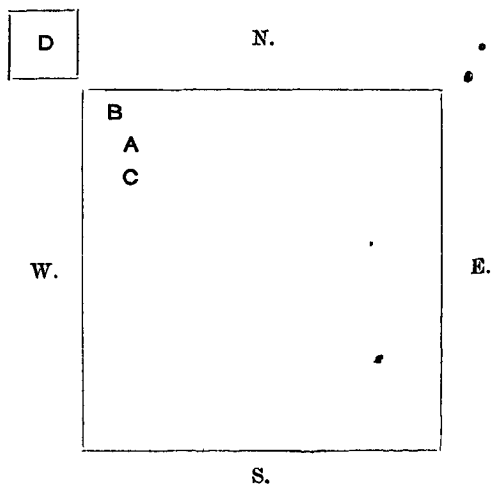
16,209. Why should not it have been so in the first instance between Hindus and Muhammadans? You told us it did not spread because there was no communication, and then you gave us other instances in which there was no communication between the two communities, and yet the disease spread from one community to the other?—After some time.

16,210. Why should not it in the other case?—It is because my theory is that the rats carried the infection from the houses belonging to the infected community to the neighbouring houses of people belonging to other communities.

16,211. Yes, but I want to know what proof you have of your theory?—As long as the disease was spread by visits of healthy persons to infected houses, or by their coming in contact with the sick, it was confined to the infected community. When the houses belonging to that community in other streets became infected, the infection was taken from those houses to the neighbouring houses belonging to the other communities by rats.

16,212. Could you give me a single instance in which you can say with absolute certainty, not simply presumption, that the disease has been carried from one house to the other by rats?—As long as we cannot follow the movements of the rats it is impossible to say that with absolute certainty.

16,213. You say it spreads from the town to a village in the neighbourhood by the migration of infected rats, and subsequently that the rats migrate in that direction, because the disease went in that direction. I cannot see the point of your argument?—Supposing *this* square represents the town of Bulsar. The north-



west end of the town was infected first of all. The first infected street—Dheberwad—was at A, and the second street, Taiwad, at B, the street on the other side of Dheberwad, called Ghanchiwad, at C, and the village of Bhagda at D. Now, the infection spread from A to B., and not to C, though the latter was also quite close; and before it attacked C or the other parts of the town rats began to die in the village of Bhagda. As, shortly after the appearance of the disease in Dheberwad (A), rats began to die in Taiwad (B), and then in Bhagda (D), situated in the same direction, and as the disease, as far as could be made out, could not have gone either to B or D in any other way, the inference is that it was taken there by rats.

16,214. Does not that simply show that the disease spread in one direction; but how does it show that it was carried by rats?—As far as I know there is no other presumption.

16,215. It is simply a presumption on your part?—Yes.

16,216. Can you tell me what evidence there is to show that the floors harbour the disease germs?—That it is the floors that are mostly affected can be inferred from the fact that a very large proportion of buboes (70 per cent.) occur in the groin, and that women whose domestic duties confine them to the house, and bring them in greater contact with the floor than men, suffer more than men.

16,217. What evidence have you got to show that women are more affected than men?—Though I have not got figures for the whole of the town I have got figures for the whole of the inoculated area in Bulsar which consists of about, I think, over 1100 persons.

16,218. How many men were inoculated, and how many women?—319 men and 469 women.

16,219. How many men got plague, and how many women?—20 men got the plague and 44 women, and the ratio per cent. to the population was 6·3 of males and 9·4 of females.

16,220. Has it been the rule in other towns that more women than men got plague?—I think our women suffered proportionately more than men.

16,221. Have you any experience of any other town?—No.

16,222. You think the disease thrives more in houses with mud floors than in houses with stone or chunam floors or masonry floors, and you say this is seen by houses of the latter description in a street almost escaping, while those with mud floors furnished a large number of cases. Which are the best class houses—those with mud or stone floors?—Stone floors, certainly.

16,223. Are the houses with stone floors more overcrowded than those with mud floors?—As far as overcrowding is concerned there is not much difference.

16,224. Are they better ventilated in any way?—Not necessarily. The instance I am going to give you is of the Parsee Street where the houses are so much

better ventilated. The Parsee Street had 34 masonry-floor houses and 106 mud-floor houses. Of these 34 masonry-floor houses, three were infected.

16,225. How many inhabitants were there altogether in the masonry-floor houses, and how many in the mud-floor houses?—I cannot say, but there cannot be much difference.

16,226. Why not?—Because the locality is not overcrowded. The Parsees are very well off, and they live in good houses. I think if you take the average population of each house at five, you would not be far off the mark.

16,227. Are the people living in stone-floor houses richer or wealthier people?—Not in all cases; in some cases they are.

16,228. Please go on with your statement?—The Parsee Street had 34 masonry-floor and 106 mud-floor houses, but of these, three masonry-floor and 24 mud-floor houses were infected, that is, 8·8 per cent. of the former and 22·6 per cent. of the latter were attacked.

16,229. You think that plague patients are frequently concealed and removed from house to house, together with infected beds and clothes?—Yes.

16,230. On account of the Government measures?—Mostly.

16,231. Could you give us examples of that?—I have no particular example, but I think it occurs in more than 50 per cent. of cases that patients are concealed up to the last, and very often their bedding and clothes are removed. When I went to see patients that were reported to be sick, to my surprise I often found the house practically empty. The cot and one sheet, and one or two cooking pots, would be left for appearance sake, and everything else that was believed would be injured by disinfection removed from the house.

16,232. What do you think is the measure that people object to most?—From the Indian's point or view, separation of the sick is objectionable. They do not like to be removed from their houses, and they do not want the sick to be taken to the hospital and the rest of the people to the segregation camp.

16,233. Do they object to disinfection?—They do.

16,234. Do they object very much?—Since they have come to know that it does them no harm they do not object so much, but they would rather be without it than with it.

16,235. Have you had any personal experience of disinfection?—I am not present there all the time, but I see a number of the houses disinfected.

16,236. Can you tell us about the Dhebras who were allowed to re-occupy their houses 16 days after evacuation?—The first case of the epidemic of 1898 among the Dhebras was detected and removed from the street (Dheberwad) on 25th April. The same day that house, with the adjoining houses on each side, was disinfected. The whole street was evacuated by the evening of the 26th. A few other houses were afterwards disinfected as cases occurred, and eventually, by 3rd May, the whole street had been disinfected. Not only were the houses washed out with a solution of the perchloride of mercury, but the roofs were opened up, and doors and windows left open, to admit light and air freely. The houses were allowed to be re-occupied on 12th May, and on the 14th a case of plague occurred in one of the houses; another case occurred on the 15th, and a third on the 18th, showing that, though the houses had been left open for more than a fortnight and had been thoroughly washed out with the perchloride of mercury solution, the infection was not completely destroyed.

16,237. How do you exclude the possibility of these cases having got infection from the town, and not from the houses?—They were not allowed to go into the infected part of the town at all.

16,238. When they came back to their houses they were allowed to go into the town?—When they returned cases of plague were occurring among the Tais only. You cannot possibly exclude the chances of the infection being brought from other houses, that is if the Dhebras had gone to the Tais' houses. But the Tais' street was guarded at the time. Nobody from outside was allowed to go into the Tais' street when it was infected.

16,239. How many guards had you?—Three guards were put there.

16,240. Day and night?—Yes, day and night.

16,241. Do you think that is enough to prevent people from going into a plague-infected street?—My experience is that people would not care to go there if there was plague.

16,242. I asked you whether three guards could guard a street?—Yes; it was at one end of the town, and all entrances to it were guarded.

16,243. Can you exclude the possibility of the Dhebras having got the plague somewhere else, and not in their own houses?—My idea is that they did not go to the Tais' street at all, and did not get the infection from anywhere else but their own houses.

16,244. Can you exclude this possibility?—You cannot exclude such a possibility. But I am almost certain that they did not go there.

16,245. You say in your précis "instances of houses "which had been disinfected after the first case, but "not evacuated, developed a second and sometimes a "third case more than 10 days after disinfection, can "also be quoted." In all these cases can you exclude the possibility of the patients having got plague somewhere else and not in their houses?—No.

16,246. Do you think if disinfection were done efficiently it would be necessary to vacate the house?—It should not be.

16,247. Why do you think evacuated houses should be left unoccupied for at least a month and a half?—From the instance of the Dhebras. When they came in a fortnight after the first case they began to get plague. They were turned out at once, and plague ceased among them. They were allowed to return a month and a half afterwards, and though the plague was still in Taiwad they did not suffer from plague afterwards.

16,248. When you say evacuated houses, I suppose you mean evacuated houses not properly disinfected?—From the remarks I have made you will see that I consider disinfection a failure. If disinfection is scientifically perfect there should be no necessity of leaving a house unoccupied.

16,249. If they were scientifically disinfected, a period of a month and a half would not be necessary?—Certainly not.

16,250. Do you think that the disease has a tendency to disappear in streets not evacuated?—The point to be considered in this connexion is that supposing on account of rains, or for other reasons, a locality cannot be evacuated, will plague disappear from the locality after a certain time? The experience of Bulsar last season was this:—four streets, Mota Taiwad, Ghanchiwad, Nana Taiwad and Parseewad, were not evacuated. The first two streets were inoculated, the last two were not. Plague disappeared from each of these localities from six to seven weeks after the first case. In Mota Taiwad it was decided to evacuate two rows of houses as cases continued to occur in them but the sudden setting in of the monsoon prevented it. The epidemic had, however, by this time spent itself, as the next week showed only five cases and after that only one case.

16,251. Do you think that rat killing is an important measure?—I think so.

16,252. How would you proceed to kill the rats?—Unless the people help themselves we cannot do anything.

16,253. Supposing the people wanted to help, how would you kill the rats?—They might be regularly poisoned.

16,254. How would you do it, there are thousands of rats infecting the streets?—If all the house-owners made up their minds to kill the rats and kept the poison exposed in certain parts of their houses at suitable times, I think there should not be much difficulty in diminishing the number of rats.

16,255. You have had a good deal of experience of inoculation, have you not?—Yes.

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16,256. I think you have a table showing the results of the inoculations?—Yes. It is as follows:—

STATEMENT giving particulars about the POPULATION in the INOCULATED LOCALITIES, the NUMBER of ATTACKS and DEATHS from PLAGUE, the MORTALITY from all causes, &c., among the INOCULATED and UNINOCULATED.

Name of the Street.	Total Population in the beginning of the Epidemic of 1898.	Number of Persons attacked with Plague before Inoculations were completed.	Number of Persons who suffered from Plague last Year.	Number of Children under Two who were not inoculated.	Number of Persons inoculated.	Number of Persons uninoculated.	Plague after inoculations in Bulsar. Among inoculated Persons. Cases.	Deaths.	Mortality per cent. of the attacked.	Among uninoculated Persons. Cases.	Deaths.	Mortality per cent. of the attacked.	Among inoculated Persons. Ratio per cent. of cases to Population.	Ratio per cent. of Deaths to Population.	Among uninoculated Persons Ratio per cent. of Cases to Population.	Ratio per cent. of Deaths to Population.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.
Dheberwad - -	216	14	7	15	170	10	4	1	25·0	0	0	0	2·4	0·6	0	0
Taiwad - -	539	3	20	17	490	9	*65	23	35·4	4	2	50·0	13·3	4·7	44·4	22·2
Machhiwad - -	116	0	0	11	97	8	8	3	37·5	1	1	100	8·2	3·1	12·5	12·5
Ghanchiwad -	319	1	3	19	261	35	7	4	57·1	4	4	100	2·7	1·5	11·4	11·4
Total - -	1,190	18	30	62	1,018	62	84	31	36·9	9	7	77·7	8·2	3·0	14·5	11·3

—*continued.*

Name of the Street.	Deaths from other Diseases May to December 1898. Among the inoculated.	Among the uninoculated.	Among Children under two.	Deaths from all Causes from May to December 1898. Among the inoculated. Number of Deaths.	Ratio per cent. of the inoculated.	Among the non-inoculated. Number of Deaths.	Ratio per cent. of the non-inoculated.	Average Population according to Haffkine's Method of Calculation. Inoculated.	Non-inoculated.	Total.	Deaths from all causes from May to December 1898. Among the inoculated. Number of Deaths.	Ratio per cent. of the average Population.	Among the non-inoculated. Number of Deaths.	Ratio per cent. of the average Population.
1.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.
Dheberwad - -	0	2	1	1	·59	2	20·0	128	51	179	1	·78	†4	7·8
Taiwad - -	6	2	1	29	5·9	4	44·4	426	36	462	29	6·8	4	11·1
Machhiwad - -	1	1	0	4	4·1	2	25·0	94	8	102	4	4·3	2	25
Ghanchiwad -	3	3	1	7	2·7	7	20	258	34	292	7	2·7	7	20·6
Total - -	10	8	3	41	4	15	24·2	906	129	1,035	41	4·5	17	13·2

* This includes two deaths from plague which occurred on 2nd and 4th May 1898, before the whole community was inoculated.
† One person, who was inoculated after he had plague, is not included in this.

16,257. Roughly speaking, 1018 people were inoculated?—Yes.

16,258. And you had 62 non-inoculated?—Yes.

16,259. If you add the total number of the inoculated to the total number of non-inoculated, you should get the total number of the inhabitants, should you not?—No. From the total number of inhabitants I have excluded those who had plague the previous year, and I have excluded children under two years of age, who are not susceptible to plague. If you add those also, you will get the total number of inhabitants in the second column.

16,260. It comes to this—that you inoculated 1018 people: you had 84 cases among these people, and 31 deaths?—Yes.

16,261. You did not inoculate 62 people, and among those there were nine cases and seven deaths?—Yes.

16,262. How does that work out in percentages?—8·2 per cent. of the inoculated.

16,263. As contrasted with 14·5 per cent. of the uninoculated?—Yes.

16,264. You had 31 deaths among the inoculated?—Yes.

16,265. That means a mortality of 3 per cent.?—Yes.

16,266. You had seven deaths among the non-inoculated, which makes a mortality, roughly speaking, of 11·3 per cent.?—Yes.

16,267. Would you turn to deaths from all causes among the inoculated and non-inoculated?—Among the 1,018 inoculated there were altogether 41 deaths, including plague, during the eight months from May to December. Among the 62 non-inoculated, there were 17 deaths. Columns 28, 29, 30, and 31 refer to the deaths calculated according to Professor Haffkine's method. He takes the inoculated and uninoculated population on a day. The next day if there has been an occurrence (*e.g.*, a case of plague, a death, or further inoculations), he takes that into consideration and finds out the inoculated and non-inoculated population for that day. This he goes on doing for all the days on which there is an occurrence. Then he totals up the figures and strikes an average. The columns 25 to 31 refer to calculations based on M. Haffkine's method. In column 30, where the asterisk is placed against the figure 4, two deaths have been included which had occurred before the inoculations were completed.

16,268. We had better take your method of calculation. In columns 15 to 23 there are 15 deaths from all causes in the 62 uninoculated?—Yes.

16,269. What is the percentage per thousand?—24·2 per cent. of the population.

16,270. Is not that enormous?—Yes, it is enormous.

16,271. How do you account for that?—It is difficult to account for it.

16,272. What is the mortality from all causes among the inoculated people?—There is a death-rate of 4 per cent.

16,273. How do you account for the fact that the uninoculated people should have died in such large numbers from all causes?—One reason is supposed to be this—that we do not inoculate sickly and weak persons, and pregnant women.

16,274. The number of pregnant women in 62 would be extremely small, would it not?—There were in all 11 pregnant women.

16,275. That is not very much?—Old persons are also left out. Even taking those points into consideration, I cannot account for this high death-rate.

16,276. Do you think that any cases of death from plague may have found their way into your "general causes"?—Two deaths might be supposed to have occurred from plague. One uninoculated weak child died of bronchitis; and a pregnant woman died 10 days after confinement from what was supposed to be puerperal fever. There is every probability that those two cases were cases of plague; but as regards the other deaths, there is no doubt that they were not from plague. Almost all the deaths occurred after the epidemic of plague was over.

16,277. Have you got a table showing the number of cases and deaths from plague and also from general causes among the inoculated and uninoculated, from the ages of five to 60, and from 60 upwards?—Yes; it is as follows:—(*See* page 320.)

16,278. Did you ever see bad effects from inoculation?—None, that I know of.

16,279. Did you have to reject any of Professor Haffkine's fluid on account of its being impure?—Never.

16,280. Did you ever notice that in a street, for instance, inoculation was able to stop plague?—Inoculations were undertaken to see whether, if people of an infected street and those of the neighbouring healthy streets were inoculated, the epidemic would be cut short by establishing among the inoculated a sufficient amount of resistance against the plague. Results showed that among the Tais, who were inoculated after their street had shown signs of infection, the epidemic was not checked by inoculations. It went on at about the same rate as among the non-inoculated till the fifth week, and practically disappeared after the sixth. The total number of attacks was about 50 per cent. less than last year, but about the same reduction was noticed this year among other non-inoculated communities. The Ghanchis were inoculated three weeks before they showed their first case, and escaped very lightly.

16,281. How many Ghanchis and how many Tais were inoculated, and how many died?—490 Tais and 261 Ghancis were inoculated. The 490 Tais had 65 cases, and the 261 Ghanchis had 7 cases. The 490 Tais had 23 deaths, and the 261 Ghanchis had 4 deaths.

16,282. Please proceed with your statement?—Inoculations kept down the mortality considerably. Only 36·9 per cent. of those attacked died, against a death-rate of 77·7 per cent. among the non-inoculated. The mortality among the inoculated plague patients was very low in the second week after inoculation (23·8 per cent.), whereas it was high in the fifth week (66·6 per cent.), and in the eight week 75 per cent.

16,283. Could you give us the data upon which you base that conclusion?—In the first week there were 13, of whom eight recovered and five died.

16,284. Have you a table?—Yes. It is as follows:—

Period after Inoculation.	Number of Cases.	Recovered.	Died.	Percentage of Mortality.
1st week - -	13	8	5	38·5
2nd „ -	21	16	5	23·8
3rd „ - -	17	11	6	35·3
4th „ -	14	9	5	35·7
5th „ - -	6	2	4	66·6
7th „ -	2	1	1	50·0
8th „ - -	4	1	3	75·0
9th „ -	1	1	0	0
10th „ - -	3	2	1	33·3
13th „ -	2	2	0	0
15th „ - -	1	0	1	100
Total -	84	53	31	36·9

16,285. Please proceed with your statement?—The inoculated Mota Tai population had a mortality of 4·7 per cent. from plague, and 5·9 per cent. from all causes including plague. The non-inoculated Mota Tai population had a mortality of 22·2 per cent. from plague, and 44·4 from all causes including plague during the course of the epidemic in Mota Taiwad.

16,286. How do you explain this mortality of 44·4 from all causes?—The number of uninoculated persons is so small—it is only nine; and out of these nine, four died—two from plague and two from other causes. About the latter two deaths, though they may have resulted from other causes, there is a strong suspicion that they were also from plague.

16,287. Do you find any difference among the Tais and the Ghanchis who were inoculated and those who were not inoculated?—There are two Tai and two Ghanchi communities living apart from each other in Bulsar. One Tai and one Ghanchi community were inoculated. The rates of incidence of the disease and mortality were higher in the uninoculated communities than in the inoculated. The inoculated Ghanchis furnish us with another proof of the value of protective inoculation. There are two streets of Muhammadan Ghanchis in Bulsar, about a third of a mile apart. When the wave of infection passed over the inoculated Ghanchiwad it attacked seven inoculated and four uninoculated persons out of a population of 296, while the other uninoculated Ghanchiwad (Kumbharwad) furnished us with 23 cases and 16 deaths in a population of 154 persons, of whom nearly half had left the town since their street was attacked. Even taking the whole population of these uninoculated Ghanchis to be present in the town, the rate at which they were attacked and died comes to 14·9 and 10·4 per cent. against 3·7 and 2·7 per cent., respectively, of the inoculated Ghanchis.

16,288. Can you tell me how in each case you ascertained the number of the population; did you take a census?—Yes, a census of the town was taken about the end of 1897; but of the inoculated area a complete census was taken again at the time of inoculation. An enumeration of all the houses was taken. The names and ages of the inhabitants of a house with all particulars about inoculation were posted on the doors of all the houses, so that when the

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The GROSS MORTALITY from PLAGUE and other DISEASES among INOCULATED and NON-INOCULATED PERSONS living in Streets in which INOCULATIONS were performed in BULSAR.

Name of Street.		Population according to Age.					Incidence of Plague according to Age.					Ratio per cent. of Cases to Population.					Mortality from Plague.					Ratio per cent. of Deaths from Plague to Population.					Mortality from other Causes.					Ratio per cent. of Mortality from other Causes to Population.				
		Persons under 5 Years of Age.	Persons over 5 Years and under 10 Years of Age.	Persons over 10 Years and under 60 Years of Age.	Persons over 60 Years of Age.	Total.	Persons under 5 Years of Age.	Persons over 5 Years and under 10 Years of Age.	Persons over 10 Years and under 60 Years of Age.	Persons over 60 Years of Age.	Total.	Persons under 5 Years of Age.	Persons over 5 Years and under 10 Years of Age.	Persons over 10 Years and under 60 Years of Age.	Persons over 60 Years of Age.	Total.	Persons under 5 Years of Age.	Persons over 5 Years and under 10 Years of Age.	Persons over 10 Years and under 60 Years of Age.	Persons over 60 Years of Age.	Total.	Persons under 5 Years of Age.	Persons over 5 Years and under 10 Years of Age.	Persons over 10 Years and under 60 Years of Age.	Persons over 60 Years of Age.	Total.	Persons under 5 Years of Age.	Persons over 5 Years and under 10 Years of Age.	Persons over 10 Years and under 60 Years of Age.	Persons over 60 Years of Age.	Total.	Persons under 5 Years of Age.	Persons over 5 Years and under 10 Years of Age.	Persons over 10 Years and under 60 Years of Age.	Persons over 60 Years of Age.	Total.
1.		2.*	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20	21.	22.	23.	24.	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.
Dheberwad	Inoculated	19	22	127	2	170	0	1	3	0	4	0	4·5	2·4	0	2·4	0	0	1	0	1	0	0	·7	0	·5	0	0	0	0	0	0	0	0	0	0
	Non-inoculated	16*a*	0	7	2	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1*f*	0	1	1	3	6·3	0	14·3	50	12
Taiwad	Inoculated	67	50	366	7	490	5	11	48	1	65	7·5	22	13·1	14·3	13·3	0	4	19	0	23	0	8	5·2	0	4·7	0	1	5	0	6	0	2	1·4	0	1·2
	Non-inoculated	17*b*	1	8	0	26	0	0	4	0	4	0	0	50	0	15·4	0	0	2	0	2	0	0	25	0	7·7	1*g*	1	1	0	3	5·9	100	12·5	0	11·5
Machhiwad	Inoculated	13	14	68	2	97	1	2	4	1	8	7·7	14·3	5·9	50	8·2	1	0	1	1	3	7·7	0	1·5	50	3·1	0	0	0	1	1	0	0	0	50	1·0
	Non-inoculated	11*c*	0	6	2	19	0	0	1	0	1	0	0	16·7	0	5·3	0	0	1	0	1	0	0	16·7	0	5·3	0	0	1	0	1	0	0	16·7	0	5·3
Ghanchiwad	Inoculated	14	31	211	5	261	0	0	7	0	7	0	0	3·3	0	2·7	0	0	4	0	4	0	0	1·9	0	1·5	0	0	3	0	3	0	0	1·4	0	1·1
	Non-inoculated	24*d*	4	24	2	54	0	0	4	0	4	0	0	16·7	0	7·4	0	0	4	0	4	0		16·7	0	7·4	3*h*	0	1	9	4	12·5	0	4·2	0	7·4
Total	Inoculated	113	117	772	16	1018	6	14	62	2	84	5·3	12·0	8·0	12·5	8·3	1	4	25	1	31	·9	3·4	3·2	6·2	3·0	0	1	8	1	10	0	·8	1·0	6·2	·9
	Non-inoculated	68*e*	5	45	6	124	0	0	9	0	9	0	0	20	0	7·3	0	0	7	0	7	0	0	15·5	0	5·6	5*i*	1	4	1	11†	7·4	20	8·9	16·7	8·9

* It may be noted that in Column 2, "Persons under 5 years of age," the inoculated are almost all over two years of age, and the uninoculated are almost all under two years of age, the latter of whom are not very susceptible to plague.
† Of the total mortality of 11 from other causes among the non-inoculated (Column 31), two only may be said to have been doubtful deaths from plague.

a 15 under two years. *b* All under two. *c* All under two *d* 19 under two. *e* 62 under two. *f* Five months old. *g* Ten months old. *h* One three months, and two over two years. *i* Three under two.

visiting officer went his rounds he would be able to know if all the people were there, whether they were attacked or not, and whether the attacks occurred among the inoculated or uninoculated.

16,289. You told us in some part of your evidence that when a case of plague occurred, the friends of the plague patient often carried the plague patient into another house?—Yes.

16,290. And that the friends often ran away and disappeared from the house?—That is so, the other inmates of the house.

16,291. How do you know the numbers you give us are correct?—The removal of the sick and the disappearance of the other inmates of the house refers to non-inoculated people only. As far as the inoculated people were concerned, there was no temptation for them to run away, or to conceal their sick, because at the commencement they were given the concession of having their sick treated in their own house, and afterwards in houses set apart in their own street. They were not segregated at all, so they had no temptation to run away, or conceal patients. In addition to that, the medical officer used to go round every day. As far as the non-inoculated people were concerned they were not prevented from going away out of the town. About half of the non-inoculated Ghanchis of Kumbharwad had left the town.

16,292. How do you know what became of them?—They had gone out in fields and distant villages; they were not within the population of Bulsar for the time being.

16,293. Were the inoculated people allowed to leave the town; did they get a special pass allowing them to go?—At that time there was a pass system in force. There was a restriction against railway travelling, and nobody living in an infected area was allowed to go out without obtaining a pass from me.

16,294. Who prevented them going out?—The railway people would not issue tickets.

16,295. Did they not go out by road?—No; our census used to tell us from day to day that they were in the town.

16,296. Did you take a census?—The medical officer went round and inspected every person.

16,297. But you have to deal with 1190 people. How could he take a census of these people every day; could he count them?—The names were put up on the houses, and all the people were called out——

16,298. Do you mean to say that he called up 1190 people every day, or every week?—It would be quite possible to do so every alternate day.

16,299. But did he do so?—He was ordered to do so, and as far as I know he did it.

16,300. But are you sure?—As I did not follow him the whole time it is impossible for me to be sure.

16,301. Do you think it is probable that he did it?—Yes, I have no reason to believe that he did not.

16,302. Then, I take it that these figures, as far as the non-inoculated areas are concerned, are only approximate?—They are approximate, as I told you; but the figures for the inoculated areas are exact.

16,303. Did you, at the end of the epidemic, see all these inoculated people, either you or your officer?—Yes.

16,304. You saw them alive?—Yes.

16,305. You had a sort of roll-call of the inoculated people?—Yes.

16,306. Do you mean to say that none of the inoculated people had left the city?—None.

16,307. Can you tell me whether the plague differed in its clinical aspects among the inoculated, and amongst the non-inoculated?—There was only this difference, that in the majority of the patients who had been inoculated, the attack was of a mild type. Very often the temperature did not rise above 102, or so, and that for a couple of days at the most. The people used to keep about—moving—so that if a regular examination had not been carried out from house to house in this area, it is more than probable that many of these cases would have gone undetected.

16,308. How do you mean they kept on moving?—They were not so sick as to be laid up.

16,309. Did you see any cases of plague pneumonia?—Yes. *Khan Bahadur P. H. Dadachanji.* 7 Feb. 1899.

16,310. Can you tell me whether you found several cases of plague pneumonia occurring in the same house?—I have no particulars as to that.

16,311. Were you ever able to trace a case of bubonic plague to a case of pneumonic plague, or *vice versâ*?—No investigation has been carried out on that point.

16,312. Have you ever seen plague occur twice in the same person?—No; I have not seen such a case. In the epidemic of 1897, 207 persons recovered, of whom about 160 were in the town. That is a rough computation. No person who had suffered from plague before was seen to suffer from plague in the epidemic of 1898.

16,313. You did not discover any; but how can you say that none of them suffered from it?—None of them were discovered to be suffering from plague. A Tai, who had plague in 1898, was living in a badly infected low house with his mother and two sisters. The mother and the sisters all suffered from plague, and this young man attended them single-hand in the infected house where the patients were left, and did not suffer from plague. The patients were not removed from their houses at all, they were left there.

16,314. Did you notice any difference in the occurrence of fever and pneumonia in the various epidemics?—Yes. In the epidemic of 1897, which commenced in the cold season, non-bubonic forms were first seen; not so in the epidemic of 1898, which commenced in the hot weather.

16,315. Do you think there is any difference in the predisposition of certain classes?—No; no community is more predisposed to plague than another. A community suffers more or less than another according to its mode of living and its sanitary surroundings.

16,316. Do you think grain has anything to do with it?—No, nothing at all. Grain is not a factor in the dissemination of the disease. The epidemic of 1897 commenced in the grain merchants' street, but that was because a number of concealed imported cases had occurred there. The epidemic of 1898 commenced in another part of the town, and the grain merchants' street, having been early evacuated, almost escaped.

16,317. With regard to the effect of inoculation, did you ever notice any abscesses?—No, not in a single case.

16,318. What was the highest temperature after inoculation?—In the majority of cases the people were not examined at all with regard to temperature.

16,319. How many people did you examine as regards temperature?—A few of the intelligent people who could ascertain their own temperature were able to give us an idea; but there was no regular examination carried out.

16,320. What was the highest temperature noticed?—103·5 was the highest.

16,321. You do not know what has been the effect upon temperature?—No.

16,322. Did you ever see any cases of diarrhœa or sickness after inoculation?—No.

16,323. Did you hear of people dying suddenly after inoculation?—A number of plague cases occurred amongst the inoculated.

16,324. That is not what I asked you. I asked you whether any cases of death occurred very soon after inoculation, say within 48 hours, from any cause?—I think perhaps a death or two occurred from plague after inoculation; but whether it was within 48 hours or not, I cannot say without reference to my books.

16,325. Could you look at your books and see whether you had any cases of plague within three days of inoculation?—I have a statement which shows in how many days after inoculation cases of plague in inoculated persons occurred. There were two cases in one day after inoculation (of whom one died and one recovered), and the rest at longer intervals.

16,326. Could you tell us where the buboes were in these cases?—In none of these cases were there buboes in the arm in which the injection was made.

16,327. I asked you where the buboes were?—It was particularly noticed that in no cases did buboes occur in the arm in which the injection was made. The particulars of attacks after inoculation, showing the

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interval between the inoculation, the attack, and the position of the buboes, are as follows:—

POSITION of BUBOES in cases of PLAGUE which occurred within ten days after M. HAFFKINE'S ANTI-PLAGUE INOCULATION in BULSAR.

Time of setting in of Plague after Inoculation.	No. of Cases.	Position of Buboes.
1 day after inoculation -	2	1, right inguinal. 1, no bubo.
2 days „ -	2	1, left axillary (chest). 1, left femoral.
3 „ „ -	2	1, right femoral. 1, left cervical.
4 „ „ -	1	1, right and left inguinal.
5 „ „ -	3	1, left femoral. 2, right axillary.
6 „ „ -	2	2, right femoral.
7 „ „ -	1	1, left femoral.
9 „ „ -	7	3, right femoral. 1, right inguinal. 1, submaxillary. 1, right axillary. 1, left parotid.
10 „ „ -	5	2, right femoral. 3, left femoral.

16,328. Did you ever see any cellulitis in the arm after inoculation?—There was a sort of erysipelatous blush around the point of injection, which lasted for about three or four days.

16,329. In how many cases?—In almost all cases.

16,330. Did you ever get a swelling with a tendency to gravitate towards the elbow?—In two cases I saw such a thing.

16,331. How big was the swelling?—It was not such as could be measured. Generally it was all round the arm.

16,332. Was it red?—Yes, it was red.

16,333. Painful?—Painful at the point of inoculation not all over.

16,334. For how long would the point of inoculation be noticed?—It could not be noticed the next day.

16,335. But there would be a swelling the next day?—Yes.

16,336. Not judging from the appearance at the point of inoculation, during what period of time could you say with approximate certainty that a person had been inoculated?—If your question has any bearing upon inoculation in Bulsar, I may say that there was no chance of inoculated persons escaping identification.

16,337. My question has no bearing upon Bulsar. We have had it in evidence that numbers of dead bodies have been found in the streets. I want to know how long you can say that a man has been inoculated by examining the point of inoculation?—I do not think you would be able to say that more than a week after inoculation, that is in case there is induration. In some cases no induration occurs.

16,338. Would you agree with the opinion that in the majority of cases after ten days it would be impossible to say whether a man had been inoculated or not?—I should agree with that opinion.

16,339. You think that is a fair statement?—Yes, I should think that is a fair statement.

16,340. You think that sometimes even after a period of two or three days you could not tell whether a man had been inoculated or not?—Perhaps two or three days is rather early, I think five days would be the time.

16,341. After a period of five days in a good many cases you would not be able to say whether a person had been inoculated or not?—No.

(Witness withdrew.)

(Adjourned till Wednesday, 8th February, at Daman Road.)

At The Waiting Room, Railway Station, Daman Road.

FORTY-FOURTH DAY.

Wednesday, 8th February 1899.

PRESENT:

MR. A. CUMINE (in the Chair).

Dr. M. A. RUFFER.

Mr. C. J. HALLIFAX (*Secretary*).

Mr. V. J. Pinto.

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Mr. V. J. PINTO called and examined.

16,342. (*The Chairman.*) You are the Plague Commissioner of Daman, are you not?—Yes.

16,343. Daman is Portuguese territory?—Yes.

16,344. What are the divisions of it?—It is divided by a river into two parts, Upper Daman and Lower Daman.

16,345. What is the population of Upper Daman?—5,400, more or less.

16,346. Is there a third division called Dholer?—That is a village of Upper Daman.

16,347. You had several imported cases from Bombay, Bulsar, and elsewhere?—The imported cases were in 1897.

16,348. How did the first epidemic begin? From what imported cases did it become indigenous, do you know?—The first epidemic began in 1897. The infection came from Karachi by a coasting vessel.

16,349. In what month was it worst?—Towards the end of April.

16,350. How many people were dying a day?—About 100.

16,351. In which caste was it the worst?—At the beginning it was worst among the Muhammadans, and then among the Machis, who are fishermen, but these afterwards segregated themselves and their patients and the mortality lessened.

16,352. When did the plague cease?—It ceased towards the beginning of June. Cases were very rare then, and the epidemic ceased.

16,353. Had you any very long intervals between the cases after June?—I was not here then.

16,354. Your experience was only up to June?—Yes up to June 1897.

16,355. Do you know of any instances where animals other than rats were attacked with plague?—Yes, cats, dogs, and pigs were found, but whether they actually died of the plague or not, I cannot say. During the epidemic, however, these animals were found dead.

16,356. Have you any experience of plague at the village of Dholer in 1898-99?—In 1898-99, yes.

16,357. When did it begin at Dholer?—At Dholer it began on the 24th of December—the first case.

16,358. How long did it last there?—It is going on, but no case has occurred since the 5th instant. It ceased for a month, however.

16,359. What month was that?—January—from the 27th December 1898 to the 27th of January 1899 no case occurred, but it re-appeared again after a dead rat half-eaten was found in the camp.

16,360. Where were you between June 1897 and December 1898?—I was in Goa.

16,361. Were any inoculations performed in Daman?—Yes, in 1897 and 1898 they were performed.

16,362. Do you know from personal investigation what the results of these inoculations were?—In 1897, yes

16,363. How did you investigate?—People who were inoculated did not get attacked, but the people who were uninoculated did.

16,364. What personal investigation did you make as to the result of inoculation?—I have not examined all the inoculated cases. I was here making house inspection to see the plague cases, and there I found inoculated people in a family not being attacked.

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16,365. Is there a witness here who has made personal investigation from house to house, and who can speak as to the inoculations?—Yes.

16,366. Very well. Plague is going on in the village of Dholer now; is it going on in Upper Daman now?—Not in Upper Daman.

16,367. Is it going on now in Lower Daman?—Yes.

16,368. When plague was bad in April 1897, did you in that epidemic attempt to evacuate the people?—Yes, it was attempted, but the people would not go, with the exception of the fishermen, who segregated themselves, and a few others.

16,369. Did you attempt removing the contacts—the healthy people in a house where a plague patient was?—The attacked were removed to the hospital.

16,370. And the healthy people in the house were left?—Yes, they were left.

16,371. Can you tell us approximately what the mortality was in the first epidemic, up to the end of June?—Probably about 2,000 or so.

16,372. Was Upper Daman infected with indigenous plague up to June 1897?—No, in 1897 there was no plague, except one case in the fort.

16,373. How many cases have there been, approximately, in Dholer, during the time you have been there?—Seventeen cases of plague from the 24th December last up to the 5th instant.

16,374. Are the people living in their houses or in the open?—They are all in camp.

(Witness withdrew.)

Mr. C. JOSE DA CUNHA called and examined.

Mr. C. Jose da Cunha.

16,375. (*Dr. Ruffer.*) What are your medical qualifications?—L.R.C.P. and S. Edinburgh, and L.F.P. and S.G.; L.M. Edinburgh and Glasgow.

16,376. What is the climate of Daman?—It is very moist. The temperature ranges between 100 at the highest and 55 or 56 at the lowest.

16,377. When is it the hottest season?—About the months of April and May.

16,378. And the coolest?—December, January and February.

16,379. What is the average rainfall?—About 55 to 60 inches.

16,380. Could you tell me something about the population of Upper Daman and Lower Daman; which part of the city is the most crowded?—Lower Daman is much more crowded.

16,381. Are the sanitary arrangements good in Lower Daman?—The sanitary arrangements are not perfect in either Lower or Upper Daman.

16,382. Are there any sanitary arrangements at all?—Just the removal of dirt from the streets, and a few houses have got sweepers to clean their latrines; and the roads are cleaned. That was done also at the time of the epidemic last year.

16,383. In 1897 they were not cleaned?—I was not on plague work then.

16,384. Were you not present when the first epidemic began in 1897?—I was in Daman then.

16,385. Can you tell us something about the beginning of the epidemic?—I think the beginning of the epidemic was about the 26th of February.

16,386. It was supposed to have been brought by a native craft?—I think it was introduced by a native craft, because when I was once on the seashore I saw the craft anchored at the entrance of the river. There was a terrible noise inside, and my attention was drawn to it, but I saw no man inside it. Subsequently I came to know that they were all children making that noise; and a day or two afterwards I learnt that there was a case of high fever with buboes in a fisherman's house. Then it made me recollect what I had seen on the seashore, the empty craft and boys making a noise inside, and I knew it was kept there for quarantine.

16,387. The fishermen had gone ashore?—Yes, and left the boys to make that noise in order to deceive the civil authorities.

16,388. When a case of plague was discovered what were the first steps taken by the authorities?—The first step at that time, in 1897, was the burning of houses—not well built houses; they are kutcha-built very weak houses, made of bamboo, or some such weak structure, with tiles on. They burnt about three of these houses.

16,389. How many houses were infected at the beginning?—One street, occupied by fisher people and Musalmans.

16,390. Were there more than three houses infected?—Yes.

16,391. What was done with the other houses?—I am not prepared to say. That was in 1897, and I was not engaged in plague work then.

16,392. At that time did they find in the houses some human bodies in an advanced stage of decomposition?—Yes.

16,393. Then the plague had been going on for some time?—Yes, for some days.

16,394. What did the people do?—They ran away, but they did not go to a segregated place; they went to another fisherman's house, and there the disease began.

16,395. Do you think the cold weather had any effect on the plague?—I fully believe it had.

16,396. Do you think that the burning of houses had a good effect?—I do not think so.

16,397. Why?—Because the rats at that time had gone to other houses, and the infection was there already.

16,398. Do you think it had any effect on plague in human beings?—I think the only effect it had was fright.

16,399. Did the people run away?—Yes, they ran away.

16,400. Did the authorities endeavour to isolate the people?—In 1897, they tried.

16,401. They carried the sick to hospital in bullock carts?—Yes.

16,402. Do you think that the carrying away of the sick was a good measure, or do you think that it proved fatal to a good many patients?—I think it killed a good many people. I fully believe in that.

16,403. Were they able to segregate the contacts?—It was impossible.

16,404. I think you removed the tiles from some houses, whether the houses were infected or not?—Yes.

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16,405. Then in March 1897 inoculations were introduced?—Yes.

16,406. Can you tell me the total number of inoculations and re-inoculations?—About 1,800.

16,407. You put in your précis of evidence about 1,924?—I was engaged in the work in 1898—I know about it; but in 1897, the inoculation was not performed by me.

16,408. Was disinfection carried out?—Yes.

16,409. How was it carried out?—Mainly by carbolic solution—crude carbolic acid, roughly diluted with water.

16,410. It does not dissolve in water?—Roughly diluted, I said.

16,411. What did you disinfect?—The floors.

16,412. Did you disinfect the clothes or the walls?—Clothes in very few cases; it was generally the walls.

16,413. You did not disinfect the clothes?—No, except the clothes that accidentally remained on the ground and got wet.

16,414. Have you got a correct record of the deaths which took place at that time in 1897?—The record is not correct.

16,415. Why?—Because the people used to conceal the cases.

16,416. When did the authorities take steps to ascertain the number of deaths?—I am not quite sure, but I think it was in the month of April.

16,417. How did they ascertain the number of deaths?—They kept sepoys on the seashore, at places where the Musalmans buried their dead bodies, and also at the places where the Hindus cremated theirs.

16,418. Do you think people buried or cremated bodies in other places?—No, I do not think so, except perhaps among the fishermen of Kharwari in Lower Daman.

16,419. What did they do with their dead bodies?—They burnt them on the margin of the river, not on the shores of the high sea. I do not know about those people.

16,420. The fishermen suffered a great deal, did they not?—They suffered the most.

16,421. Are their huts very clean?—They are made of cow-dung.

16,422. Are they well ventilated?—I cannot say that they are well ventilated. They have a front door and a back door.

16,423. So that they always get a certain amount of air through?—Yes, and their streets are always from east to west.

16,424. Did the Musalmans suffer more than any other communities?—After the Hindus.

16,425. Are there many Musalmans in Daman?—Yes.

16,426. Are the majority of people Musalmans?—No, Hindus.

16,427. The plague stopped in Daman in the beginning of July 1897?—Yes.

16,428. In Kharwari, it continued at long intervals till August?—Yes.

16,429. Where is Kharwari?—It is on the east of the population of Lower Daman, separated by a marshy bit of ground.

16,430. During these months in 1897, did the plague rage in both Upper and Lower Daman?—In 1897 there was no plague in Upper Daman. There were a few cases, and I think among them there were a few indigenous too.

16,431. There was no communication between Upper and Lower Daman, was there?—No, no communication.

16,432. In January 1898, the plague broke out afresh in Dholer, did it not?—Yes.

16,433. That is a parish in Upper Daman, is it not?—Yes.

16,434. It was imported there from Kharwari, was it not?—It was supposed to have been.

16,435. Do you think it was not?—I think it is probable that it was the case.

16,436. Did it spread quickly in Upper Daman?—Not very quickly, it took some days.

16,437. How many days?—I cannot say.

16,438. How many people were living in Upper Daman?—About 5,000, I suppose.

16,439. How many at Dholer?—About 300 to 400.

16,440. How many died?—Over 130.

16,441. In how many months?—From the 4th of January to about the end of March.

16,442. Were the authorities able to induce the people to evacuate their houses?—No, not in 1898.

16,443. Or to isolate their sick?—No.

16,444. Were any people inoculated?—At Dholer, none.

16,445. In how long did the whole epidemic run its course?—In a short time—from January to March—three months.

16,446. Did the Government put a cordon round the village of Daman?—Yes, round Upper Daman.

16,447. Do you think people escaped?—I think so.

16,448. During that time the Fort in Upper Daman was absolutely closed, was it not?—Yes.

16,449. Did rats die in the Fort?—Dead rats were found in the Fort.

16,450. Were all the people in the Fort inoculated?—Almost all.

16,451. Who lived in the Fort?—Soldiers in their barracks, and besides some families that had run away from Upper Daman.

16,452. How many soldiers were there in the Fort?—There must have been about 140 or 150 soldiers.

16,453. Are they native soldiers?—Yes.

16,454. How many Europeans are there in the Fort?—The Europeans last year were very few, about five or six.

16,455. I suppose the houses in the Fort in Upper Daman are fairly good?—Fairly.

16,456. Are they better than in Lower Daman?—They are better, but the soil is not so good; it is very damp.

16,457. Is it on a hill?—No.

16,458. The Fort is quite closed, and absolutely distinct from the rest of the city, is it not?—Yes, it is surrounded by the walls.

16,459. Did the people evacuate their houses in Upper Daman in 1898?—Yes.

16,460. How many people were inoculated in Upper Daman?—333.

16,461. And about 101 re-inoculated?—Yes.

16,462. Altogether you had 446 attacks and 332 deaths?—Yes; but not of the inoculated.

16,463. Do you know how many of the inoculated people died?—About 18 in all—18 among the whole lot of them. I am not speaking of those only inoculated by me.

16,464. What is the population of Upper Daman?—About 5,000, I suppose.

16,465. To what do you attribute the short duration of the epidemic in Upper Daman?—Merely to the evacuation of houses.

16,466. Where did the people go to when the houses were evacuated?—Most of the Christians went to the seashore—the Christians and some of the fishermen. A great many of them went to the fields.

16,467. How did you ascertain the number of people who died either in the fields or on the seashore?—They were known people.

16,468. Who went to see how many people died?—A medical man went round every day.

16,469. Do you think he got the right number?—Not quite correct, but approximately so.

16,470. Do you believe that during the epidemic of plague rats emigrated from one place to another?—Yes.

16,471. Why do you think so?—Because as soon as an epidemic begins dead rats are found in many houses before the inmates get attacked.

16,472. But why do you think these rats belonged to other houses?—Because I observe that where a dead rat was found, the house was almost immediately empty of rats; they ran away.

16,473. How do you know they ran away, they might have died in their holes?—I know because I observed it in my own house godowns, where they all ran away. After the first batch of five of them died there were no more rats to be found.

16,474. How many rats had you in the first instance?—Thousands.

16,475. Did you find that mice died from plague?—I did not hear of any mice dying.

16,476. Why do you think the people in the Fort escaped the disease?—Because they evacuated their houses immediately they found dead rats.

16,477. Where did they go to?—They went to other houses in the Fort. These houses were thoroughly disinfected.

16,478. How were they disinfected?—With carbolic lotion.

16,479. Everything in the house?—The ground.

16,480. Was anything else disinfected—clothing and so on?—I do not think clothing was disinfected.

16,481. I suppose the Fort was quite isolated by a cordon?—Yes.

16,482. And being surrounded by a wall, the cordon would be efficient?—Yes.

16,483. Were there any instances of the cordon being broken through?—Not that I know.

16,484. When did the epidemic of 1898 begin in Lowe Daman?—About the middle of March.

16,485. Did it spread quickly?—It spread quickly in that locality among the fishermen.

16,486. What is the population of Lower Daman?—About 7,000, I suppose.

16,487. What was the number of attacks and deaths?—872 attacks and 592 deaths; that is almost correct.

16,488. Why do you say almost?—Because the cases are reported to the Government by medical men. The districts are divided into parts, and each medical man had one part.

16,489. Who suffered the most this year?—Again the fishermen and the Musalmans.

16,490. Why did they suffer most?—I cannot say. The surroundings and the houses are not clean at all, especially the Musalmans'.

16,491. Did they evacuate their houses?—The Musalmans did not.

16,492. Did the Hindus evacuate their houses?—Yes, more readily.

16,493. You had the same measures in 1898 as in 1897, I suppose?—Yes, except the forced evacuation and isolation. In 1898 a good many of the people believed in evacuation.

16,494. How was disinfection carried out this year?—By the same process.

16,495. But more houses were disinfected?—Yes.

16,496. You disinfected chiefly the floors, did you not, and places where you found dead rats?—Yes.

16,497. You then left the houses open after they were vacated and disinfected for about 10 to 15 days?—Yes.

16,498. Did you notice that people going back to their houses got plague?—Yes, I saw it among the fishermen last year.

16,499. Did you find that the Hindus evacuated their houses as soon as they found a dead rat?—They were easily persuaded to do so if they did not do it of their own accord.

16,500. Did you notice that plague attacked people who were already sick or weak in any way?—Not particularly.

16,501. Ordinary colds were followed by plague?—A man got wet in the monsoon, he came home and remained with simple fever for days, and suddenly the man got buboes and died on the third day after their appearance.

16,502. Did you have any cholera this year in Daman?—No.

16,503. Was there any in 1898?—No.

16,504. Is there cholera every year?—No.

16,505. Did you find that people died of malaria and other diseases during the plague?—There were very few cases of malaria.

16,506. The plague was accompanied by a diminution of malaria cases?—Yes.

16,507. Do you think that this diminution may be explained by the fact that medical men had less time to look after ordinary cases because of the plague?—No, I do not think so.

16,508. What is the age at which people are most subject to plague?—Between 20 and 40.

16,509. Do old people suffer from plague very much?—A good many died.

16,510. Did children under five suffer from plague?—Very few.

16,511. Can you give the number of children under five attacked by plague; and the number of deaths in children under five; and in children five to 10; then from the age of 10 to 20; from 20 to 40; from 40 to 50; from 50 to 60; and over 60, among the non-inoculated people?—Yes. The figures I can give do not apply to the whole of the attacked or dead in 1898 in Lower and Upper Daman (Dholer excluded). They were rendered imperfect owing to one of the medical men on plague duty not having marked for some time the patient's age in his daily bulletins. I have been able to get them only for a part of the gr and total attacked, as you will see by an addition of the figures. During the plague epidemic of 1898 there were in all 1,318 attacked and 224 deaths, and I can give age statistics for 625 deaths only. The age in almost all the cases has been guessed by the medical men, as there is generally no record kept among the Musalmans and Hindus. The figures are as follows:—

Children under 5 years attacked - -	64
Deaths under 5 years - - - -	39
,, between 5 and 10 years - -	67
,, ,, 10 and 20 ,, - -	136
,, ,, 20 and 40 ,, - -	230
,, ,, 40 and 50 ,, - -	70
,, ,, 60 and 60 ,, - -	52
,, over 60 years - - -	31

16,512. Have you ever seen cases where people got attacks from treading on dead rats?—Yes.

16,513. Will you give us the particulars of one case?—It was a fisherwoman, about 25 years of age. She went with her father-in-law to their house which they had vacated to go and live on the seashore. They came from the seashore one day and opened the house, and as she was going to enter the house she put her foot on a dead rat. The very same evening she had fever.

16,514. Did she die of plague?—No, she did not die? she lost her father-in-law and her husband.

16,515. Did she get plague herself?—Yes.

16,516. Do you know of any other cases?—I have heard of other cases.

16,517. You do not know of any yourself?—No.

16,518. Do you believe that infected clothing can carry plague?—Yes.

16,519. Have you got any facts that you can tell us about that?—Only in the beginning of epidemics, where they begin without a plague patient getting into the country; for instance, at Dholer there was a case of plague in December last, and I do not think that any plague patients got into Dholer.

16,520. Have you noticed that plague entered through cracks and fissures in the skin?—I believe that is the case.

16,521. Have you noticed that women suffer more than men?—Yes.

16,522. To what do you attribute that?—I attribute it first to their being in the house almost the whole day, the Musalman and Hindu native women. Most of the children play about outside the house, but the women are almost always in the house.

16,523. Do you believe that it is a filth disease?—No, I do not believe that.

16,524. Can you give me any instances why you do not think so?—I have seen cases where the houses have been surrounded by a great lot of filth, and even the houses themselves were filthy, but they had no attacks in that house.

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16,525. Did you have many attacks among the scavengers?—Not that I know of.

16,526. Did you find that the Dhers suffered much?—In 1898; there were very few cases in 1897.

16,527. Have you anything to tell us about special characteristics of plague noticed by you?—One curious thing I remarked was that some of the patients were not able to speak; they pointed to their chests, and did not know what was the matter with them.

16,528. Did you see many cases of plague pneumonia?—I only saw one.

16,529. Did you get other forms of pneumonia?—None.

16,530. Did you ever see any paralysis of the lower eyelid?—I do not know of it.

16,531. Have you noticed the extremely anxious expression of plague cases?—Yes.

16,532. How do you explain that? Do you think it may possibly be due to the eversion of the lower eyelid?—I have not noticed that. I saw one girl, especially, she was about six years old, and she had not her lower eyelid everted.

16,533. Have you ever seen paralysis of the tongue?—Yes, in one particular case, a very marked paralysis.

16,534. The patient could not protrude his tongue?—He could not speak at all, the man was entirely dumb.

16,535. He could not articulate?—He could not articulate, he could not move his tongue in his mouth.

16,536. Have you had any special treatment?—No.

16,537. Do you think any drug does any good in plague?—I do not think any medical treatment has any effect.

16,538. What is, in your opinion, the most frequent incubation period?—About six days.

16,539. Why do you think so?—Because most of the cases I saw had six days.

16,540. How did you trace the cases?—By persons coming in contact with plague patients, and going from one plague house to another house.

16,541. Plague was all over the town, so that one patient might have come across several patients; how do you know from which case he inoculated himself?—I saw some cases which I could trace.

16,542. Could you give us instances of such cases?—I cannot give them now, I took only mental notes.

16,543. You say in your précis that you have heard of cases of 13 days incubation period. Could you give us some particulars of them?—No.

16,544. Do you find that pregnant women almost always miscarry?—Yes.

16,545. Is the disease very fatal in them?—Yes.

16,546. Did you ever see a dog with plague?—I saw one, but I have heard of several.

16,547. How do you know it had plague?—They told me so. I did not examine it myself, so I do not know.

16,548. Did you ever hear of pigs and jackals getting plague?—No, not jackals.

16,549. Did you ever see a person have plague twice?—Yes.

16,550. Could you give us an instance of that?—I saw a man, a servant of a baker, who lived among the fishermen on the seashore. He had plague in 1897.

16,551. Did you see him then?—I did not see him, but his master saw him.

16,552. When did he have the plague again?—In 1898.

16,553 Did you see him then?—No; he was not treated by me.

16,554. Can you tell us the clinical symptoms of this case in 1897 and 1898?—Yes; the man named Gopal Hurio, about 28 years of age, reports having been attacked in 1897. He was not inoculated that year. Had *no bubo*, but high fever with shiverings, and a very strong headache. He was kept in a hut on the seashore, close to huts full of plague patients. He had injected eyes. No other treatment was applied besides branding on the calves, on the frontal region, and on top of the head. He recovered. In 1898 he was inoculated by me in April, and was attacked about a month later. He had a bubo in the left groin, which was branded. He lived in very infected quarters, among fishermen. He had strong headache, high fever, and all oth r symptoms of true plague. Had his mother treating him for a time. Got plague with bubo, and died. She was not inoculated.

16,555. Will you also add to your evidence any other instances of this sort that you can find?—(Note by witness on correcting proof of his evidence:—I would have most gladly done it, were it not for the short space of time given me. The people have also closed their houses, and gone to live in open fields, on account of plague.)

16,556. Do you think cordons are of much use?—I do not think it any use while the infected population is close to the clean one.

16,557. You think the people get through the cordon if they want to?—Yes, they easily break through.

16,558. How many persons were inoculated in 1897?—About 1,900.

16,559. How many in 1898?—In all, about 2,500.

16,560. How many have you yourself done?—About 1,535 inoculations and re-inoculations in 1898.

16,561. What was the strength of Haffkine's prophylactic fluid that you used?—The fluid I used was twice the quantity of the standard dose.

16,562. How did you judge of the strength?—It was written on the label.

16,563. You did not make experiments of your own to determine the strength?—No.

16,564. Did you reject any bottles?—Several.

16,565. Why?—Because the contents smelt of fish.

16,566. Was that due to the cork, or the bottle being faulty?—I cannot say, but I refused them at once.

16,567. Did you ever have any evil effects from Haffkine's fluid?—Evil effects, yes, but none fatal.

16,568. Can you describe what evil effects you saw?—I saw several cases of abscesses at the seat of puncture.

16,569. Did you see abscesses in several people after using the same bottle of Haffkine's prophylactic fluid?—I saw cases of abscesses, but I remarked that all the persons did not get abscesses after being inoculated from the same bottle.

16,570. Did you ever see high fever?—None.

16,571. What was the average temperature that you got after inoculation?—The average was about 103.

16,572. How many temperatures did you take?—I took several.

16,573. How many?—I cannot recollect.

16,574. How often did you check the temperatures in the cases in which you took the temperatures?—About three times a day.

16,575. At what intervals?—At the height of the fever.

16,576. How did you know the height of fever?—Even in my own case, I had the thermometer several times on, and never found the fever more than 102·5.

16,577. Can you describe your own symptoms?—In the beginning I felt slight chills about the lower extremities, and then, after about four or five hours, I felt a burning pain in the eyes, and later on fever which did not keep me in bed; in fact, I walked about without knowing I had fever on; but what gave me great trouble was the inoculated arm. It was swollen and very painful.

16,578. For how long?—For two or three days; two days, I suppose.

16,579. Did you get a bubo in the axilla?—No.

16,580. In the first cases you inoculated 7 c.c., did you not?—7·5, I think.

16,581. And then you diminished the dose?—Yes.

16,582. Why?—Because the effect was rather alarming.

16,583. In what way?—The height of fever.

16,584. Did a fisher boy in 1897, and a Brahman woman in 1898, get plague within a few hours of the inoculation and die on the fourth day?—Yes.

16,585. These persons, you think, were already in the incubation period?—Yes.

16,586. Were they living in an infected locality?—A very infected locality.

16,587. Did you refuse to inoculate certain people?—I refused those suffering from malarious fever when that day was the turn for the fever.

16,588. Did you refuse anybody else?—I refused those who had fever on, and those who were very anæmic. Those were the only persons excluded.

16,589. People with scrofula?—I inoculated some, not all; but they showed an enlarged gland.

16,590. Did a young lady get a temperature of 106?—I think over 106, but I do not recollect it correctly.

16,591. What do you think was the reason for that temperature?—It was that she was suffering from malarious fever of the tertian type.

16,592. Did you ever see delirium after inoculation?—Yes.

16,593. Was there strong headache and loss of appetite?—The latter was generally the case.

16,594. What was the age of the 152 re-inoculated people of whom you have got notes?—17 were less than five years of age, 134 were between 5 and 60, and there was one above 60.

16,595. What was the age of 1,383 people inoculated once?—144 under 5, 1,232 between 5 and 60, and 7 were above 60.

16,596. How many of the re-inoculated people died of plague?—It is a question as to what cases can be called re-inoculated. I do not think any who were inoculated again within 30 days died of plague.

16,597. Did any people who had been re-inoculated in two different years die of plague?—Yes, I think so.

16,598. There was a certain Brahman from Upper Daman, 50 years old, who was inoculated in January and again in March, was there not?—Yes.

16,599. And he died?—No, he got the plague, but there was a great interval—three months—between the two inoculations.

16,600. How long after the second inoculation did he get plague?—About 11 days afterwards.

16,601. Were there any people living in the house?—There were five other persons.

16,602. Did any of them get plague?—None of them got plague.

16,603. Were they all inoculated?—Yes.

16,604. How many of the grand total of inoculated and re-inoculated in 1898 got plague?—About 48.

16,605. How many died?—About 18.

16,606. How do you know that?—By the daily bulletins.

16,607. How do you know that some of those thousand odd people did not leave the town?—They could not do so.

16,608. Why?—There was a strong cordon on the British frontier. The Surat Collectorate, however, did grant passes to several people, and several left the territory for different places.

16,609. Is there a cordon now?—No, it is removed. It was maintained last year till the 3rd of November, when it was removed.

16,610. How do you know they have not left the town since the cordon was removed?—Because plague was over then.

16,611. You said that 18 died. How do you know that only 18 died?—Because the cases were inquired into. The medical men in charge of the division always inquired whether the attacked person was inoculated or not. There was a daily bulletin.

16,612. Have you seen the thousand odd people again since you re-inoculated them?—I saw several of them.

16,613. How many have you seen again?—With regard to the re-inoculated, I inquired into all of them.

16,614. But how about the others; how many have you inquired into?—I cannot say many, because a good many of them left the town after the epidemic—after the cordon was removed.

16,615. Are those people included in the list of those operated upon by Prof. Haffkine and Major Lyons?—No, that was in 1897.

16,616. What was the least interval between the inoculation and attack?—I should think about five days—from five to seven days.

16,617. What was the greatest interval?—I am not quite prepared to say what was the greatest interval.

16,618. In the Fort alone you inoculated 381 persons and registered 31 re-inoculated—in all, 412?—Yes, that is right.

16,619. Do you believe that the greatest part of those people were re-inoculated?—Yes.

16,620. Although it does not appear in your register?—Yes.

16,621. Were many of them employed in plague work?—Not within the Fort. 45 soldiers were employed in Upper and Lower Daman.

16,622. Did they come back to the Fort every day?—No, they were not allowed to do so.

16,623. Did one of them die?—One died; he was not inoculated.

16,624. Did you observe the effects of inoculation in a family of nine persons, eight of whom were inoculated twice within a month, and one of whom was inoculated only once?—Yes.

16,625. What happened in that family?—The person who was inoculated only once was attacked with plague about 33 or 34 days after inoculation. The man was of the Dher caste. He was a servant in the house, and he could not be re-inoculated when the owner of the house and his family were re-inoculated because of great difficulty, as he belonged to that caste.

16,626. Did you find that inoculation revived old complaints?—Yes.

16,627. What for instance?—Rheumatism especially.

16,628. What else?—I have seen some cases of parametritis.

16,629. But nothing serious?—No.

16,630. Did you find it upset peoples' livers occasionally?—Yes, when they suffered from liver complaint.

16,631. Do you know of any beneficial effects of inoculation on diseases other than plague?—I have seen one case of a Parsee boy who got entirely free of hemicrania.

16,632. Anything else?—Malarious fevers and rheumatism.

16,633. (*The Chairman.*) I think you said that inoculated people could not run away in the fair season of 1897 because there was a cordon of British sepoys to prevent them going through British territory. But they might have gone away by sea, might they not?—Yes, they might have; but there was quarantine in force in almost all the ports. They were not received. I know attempts were made, but they were not received.

16,634. Not received in Bombay?—In Bombay there was quarantine and strict examination.

16,635. Was there quarantine on arrivals by sea in Bombay?—Yes.

16,636. Is it within your knowledge whether they did or did not go away and endure quarantine?—I know that some attempted to go. I know of one instance where they tried to go to the south of Daman and were refused admittance. The boat came back. A boat full of carpenters and some Hindus was going to Bombay, but it could not proceed because of the bad sea. Such things took place.

16,637. The people you spoke of are people who tried to get away and failed. But can you say that there were not a number of inoculated people who succeeded in getting away by sea?—I can say that a great number of inoculated people did not get away.

16,638. How do you know?—I know most of the people.

16,639. Of the 2,000 inoculated?—Yes, Daman is a very small place.

16,640. What is the system of death registration in Daman?—A ticket is obtained from the Plague Commissioner. Previously the people used to go to the Chief of Police.

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16,641. Is there any obligation on the people to report deaths in Daman?—I do not know.

16,642. Does any record exist of the deaths which occurred between July 1897 and January 1898 in Lower Daman?—There is a record, but I do not think the record for 1897 is quite perfect; it is more perfect for 1898.

(Witness withdrew.)

Mr. J. Moniz.

Mr. JOHN MONIZ called and examined.

16,643. (*The Chairman.*) I believe you are a Licentiate of Medicine and Surgery?—Yes.

16,644. Are you Medical Officer for Daman?—No, I was Acting Medical Officer from August to December 1898, but in Government service during the epidemics of 1897 and 1898.

16,645. You say in your précis of evidence that almost all cases of intermittent and remittent fever of the malarious type have degenerated into plague; what does that mean?—I mean that people who got malarious fevers got symptoms of plague and died of plague during the epidemics. They had buboes latterly.

16,646. Have you remarked any connection between misty weather and an increase in the number of plague attacks?—On two occasions I have noticed misty weather and suddenly plague cases have taken a different turn, jumping from place to place, and being carried to great distances. There was a cordon round the river established by the Government, and another round the village of Dholer, and on one occasion, when the weather was misty, I saw plague cases occurring outside the cordon round Dholer, at a distance of a quarter of a mile northwards.

16,647. Have you noticed that this occurs on all misty nights?—A misty night is rather rare. It is very seldom that we have a very foggy night.

16,648. Have you noticed misty nights when this has not occurred?—I have not noticed that.

16,649. Have any cases come under your notice where people have caught plague a second or even a third time?—Yes. Only the day before yesterday a case came under my notice where a man had plague a second time after the lapse of one year. He had plague in 1897 with buboes in the neck. Four days ago he was attacked with plague a second time and died. He had a bubo in the axilla, under the armpit. He was a fisherman.

16,650. How is it within your knowledge that he had plague a year ago?—Because I had treated several persons affected with plague in the same house in which he lived. One was operated upon for gangrene of the foot following on buboes.

16,651. How did you know that this man had plague a year ago?—I treated him myself.

16,652. That is one case. Do you know another?—I know of another case of a man who was inoculated and had buboes last year at the beginning of the outbreak of 1898; and in the month of October he was again attacked with plague, and had a bubo just below the place where he had them before in the groin. That is a second case.

16,653. Did you see him the first time he had plague?—No.

16,654. How do you know he had plague before?—I treated the man the second time, and he told me that he had had plague before.

16,655. Have you seen any case where a man has had plague three times?—Yes, I have seen that in the case of a fisherman. I saw him have it at intervals of one month and a half. He had buboes in different parts of the body. Within the space of six months I saw him have it three times.

16,656. You saw him on all three occasions?—Yes.

16,657. Is it within your knowledge that children are more liable to plague than men?—No, I do not say so. I say that, generally, children and women die more than men.

16,658. Have you performed any inoculations yourself?—No, never.

16,659. Have you, to any extent, been able to keep a watch upon inoculated persons?—Yes. I treated the whole of Upper Daman from the 22nd of February to the 22nd of May last year. All the plague cases, as well as those persons who had been inoculated, were treated by me.

16,660. How did you know which had been inoculated and which had not?—I used to go to the patient's house, and I used to ask him whether he was inoculated or not. That is the first question. As soon as he told me that he was inoculated, I took his name down, and reported it to the Government. That was the daily practice.

16,661. How did you know that all the people who were attacked reported the attack to you?—I kept soldiers to watch, and they at once reported plague cases to me. Of course I could not go over the whole place myself; I used to go for three or four hours, and then come back.

16,662. How many attacks amongst inoculated people came to your notice?—Many came to my notice. I have given my statistics to His Excellency the Governor.

16,663. Can you not remember how many came to your notice?—I cannot say how many came to my notice, because I used to supply the Governor with information daily.

16,664. During the first epidemic in Lower Daman in 1897, had you any opportunity of seeing how many inoculated people were attacked?—Yes, I had.

16,665. What opportunity had you?—I used to go about. I was appointed by Government to serve as the medical officer, and treat the people in their own houses, and see that they were sent to the segregation camp. Of course, then I used to see those who were inoculated, and were suffering from plague.

16,666. Can you say of your own knowledge how many of the inoculated people were attacked with plague in 1897?—About 25 or 26 persons.

16,667. Do you think it was possible, with 50 or 60 people dying a day, to find out regarding each dead body whether the person had in life been inoculated or not?—In the year 1897 there was so much confusion and panic that it was impossible to take down all these particulars. It was only in 1898 that the work was properly done.

16,668. Did any instance come to your knowledge where a person who had been three times inoculated died of plague?—Yes; I know the case of a Banniah, who died in the month of August, 1898.

16,669. How long after the third inoculation?—I cannot say, because I was not in charge of the inoculation.

16,670. Could you tell us the mortality from all causes during 1897-98 among the inoculated and the non-inoculated?—I cannot tell you that.

16,671. From whom can we get those figures?—You will be able to get them from His Excellency the Governor.

16,672. Shall we be able to get them from any of the witnesses who have come here?—No.

16,673. (*Dr. Ruffer.*) Can you tell me whether the first attack was mild in the first case mentioned by you, in which a man suffered from two attacks of a form of plague?—The first attack was a mild one.

16,674. Where was the bubo?—In the neck.

16,675. How long did the bubo last?—It lasted about 12 days.

16,676. Did it suppurate?—Yes, it suppurated and burst.

16,677. Did he have fever?—Yes, he had fever and all the symptoms of plague.

16,678. What other symptoms of plague had he?—He had an anxious expression of the face, high fever and delirium, and shooting pains in the neck.

16,679. Was there any plague in the house?—Yes.

16,680. In the second attack where was the bubo?—The bubo was in the left armpit.

16,681. How long did the bubo last?—The second attack I only saw four days ago.

16,682. He has plague now?—He had plague four days ago; he died the day before yesterday.

16,683. How long after the first attack was that?—The first attack was in April, 1897.

16,684. In the second case of plague you mentioned, where was the bubo the first time?—The first time it was in the groin.

16,685. Did you see the bubo?—He told me he had a bubo, and I saw the mark of branding.

16,686. Do you know whether he had fever?—Yes.

16,687. Was he very ill?—He was not very ill. He said he had slight fever and a bubo, and that the bubo burst after it was branded.

16,688. How long did the bubo take to heal up?—The first time he got it I do not know.

16,689. Did he have syphilis?—No.

16,690. Are you quite sure that he had no gonorrhœa at the time, or soft chancre?—Yes.

16,691. Where was the bubo on the second occasion?—The second time it was just in the groin, but a little below.

16,692. On the same side?—Yes, but a little below.

16,693. Did you see him the second time?—Yes.

16,694. What other symptoms of plague he?—I was sent by Dr. Pinto to see the case. He had high fever and delirium, and he had a bubo in the groin.

16,695. How big was the bubo?—The bubo was the size of an ordinary egg.

16,696. How long did it last?—About 13 days.

16,697. Was it painful?—Yes.

16,698. Did it suppurate?—Yes.

16,699. What was his temperature?—His temperature was 102° or 103°.

16,700. What was his tongue like?—His tongue was foul.

16,701. There was no question of chancre or gonorrhœa?—No.

16,702. Did you examine his feet on the same side to see if there were cuts or abrasions?—Yes, I did. He was a young boy 12 or 13 years of age.

16,703. Had he any lymphangitis, inflamed lymphatics running up the leg?—No, he only had one tumor, which I saw.

16,704. In the case of the man who had plague three times in six months, where was the first bubo?—The first bubo was in the armpit.

16,705. How long did that bubo last?—It lasted about 10 or 15 days.

16,706. Did it disappear?—Yes, it disappeared.

16,707. Completely?—Yes, completely.

16,708. Had he high fever at that time?—Very high fever.

16,709. Where was the second bubo?—In the neck.

16,710. How long after the first?—A month and a half after the first.

16,711. I forgot to ask you whether the first bubo suppurated?—No, it did not suppurate.

16,712. Was it hard?—Yes, it was hard.

16,713. Was it painful?—Yes, it was very painful.

16,714. Had he high fever?—Yes.

16,715. The second bubo was on the neck?—Yes, in the neck; both sides.

16,716. How long did it last?—It lasted about 10 days.

16,717. And then disappeared?—Yes, and then disappeared.

16,718. Completely?—Yes, completely.

16,719. Without suppurating?—Yes, without suppurating.

16,720. Had he fever then?—Yes, he had fever. I know he had fever, because he was sent to me for treatment. I saw him when he had high fever.

16,721. Where was the third bubo?—In the groin, on either side.

16,722. On the same side?—Both sides.

16,723. How long did that bubo last?—That lasted about eight days.

16,724. Was it painful?—Yes, it was very painful.

16,725. Was it very tender to the touch?—Yes.

16,726. Did the patient have fever?—Yes, he had fever.

16,727. How old was the man?—He was a fisherman, about 25 years old.

16,728. Was he married?—Yes, he was married.

16,729. Do you know anything about his wife: do you know whether she has had any miscarriages?—I do not know.

16,730. Has he any children living?—I do not know.

16,731. Did you examine him for syphilis, or any of the children?—Ordinarily, these fishermen do not get syphilis.

16,732. Why?—I have been treating them for the last 8 or 10 years, and I have only seen very few cases of syphilis among these fishermen.

16,733. Did you examine this man's lungs?—No I did not.

16,734. Are you sure that he was not a scrofulous person?—I cannot say that.

16,735. Do you know whether he had had malaria?—I do not know.

16,736. Do fishermen suffer from malaria very much?—Yes, ordinarily.

16,737. Are you sure that these were not malarious glands?—I do not know.

16,738. You think it was a case of plague?—Yes.

16,739. But are you quite sure that you could exclude its being something else?—I cannot say, for I examined this man and noticed in him all the characteristic symptoms of plague as it was then raging.

16,740. What else do you think it might have been?—They might have been due to scrofulous enlargements coming on again; they might be due to cuts or abrasions in the feet.

16,741. (*The Chairman.*) Beside Upper and Lower Daman, how many villages are there in the Daman territory?—There are many other villages around Daman. There are the villages of Wadkund, Karwari, Katheria, and Dholer. In these villages plague raged.

16,742. Can you tell me at what time these different villages have been infected?—Dholer was infected from the beginning of January 1898 to the month of April, when the epidemic ceased. At Katheria the epidemic began in March 1897, and finished towards the end of June. At Karwari it began in March 1897 and ended in July of the same year. Then it began again at Karwari in the month of December 1897. From Karwari it went to Dholer, and the plague broke out in Dholer in January 1898, and finished about the end of April. Then it went over to Upper Daman. Dholer is a village south of Upper Daman. Plague spread northward in the direction of Upper Daman and lasted till the 22nd o May 1898.

16,743. Since it first appeared in February or March 1897, can you say that there has been any time when you are positive that the whole of Daman territory has been free from indigenous plague?—As this is a very malarious district, I cannot say that. There is one circumstance I wish to mention, and that is, I noticed many cases of simple malarious fevers come on again which I used to see before the outbreak of plague, but no buboes or tumours in the patients were seen or observed.

16,744. You reported to His Excellency the Governor that a certain number of deaths had taken place amongst the inoculated in Upper Daman in 1898. Had you any register of all the inoculated people in Upper Daman?—The register was with His Excellency the Governor.

16,745. It was not with you?—No, it was not with me.

16,746. How do you know, then, to what extent the inoculated people were present in Upper Daman?—They used to tell me when they were inoculated; and if they suffered from plague they told me.

16,747. Supposing they had gone away, they could not have told you. To what extent do you know that they remained in Upper Daman, and did not go away to Bombay and other places?—They did go away. I knew many that went away, even during the time of

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the epidemic. They had to undergo quarantine here on the British frontier. They went away to different places.

16,748. Was that in 1898?—Yes, in 1898 and in 1897.

16,749. Did you, or anybody else, ever go round with a register of inoculated persons in order to look at each person on the register, and have them all up and thus find out who was alive and who dead?—No.

16,750. (*Dr. Ruffer.*) Did you ever see bullous eruptions in plague?—I have seen blebs of large size, the size of an ordinary cricket-ball over the feet, and followed by buboes in the popliteal space, and on the groin. These blebs, if not cut open in a day or two, were followed by gangrene of the extremities, just beginning at the portion where the bleb was: the bleb was of a distinct red colour.

16,751. How long after the disease does this gangrene set up?—I saw the bleb five days afterwards. When the bleb was not opened and was not antiseptically treated, gangrene would set in.

16,752. What were the symptoms of the gangrene?—Black marks, mortification of the part, the part dying away, feeling of insensibility, and an offensive odour, as if the part was in a state of putrifaction.

16,753. Did the cases die?—Yes, two cases died and one got well. He was inoculated.

16,754. In his case did you have to amputate the foot?—No; I cut off the upper portion where the gangrene was, and applied ordinary antiseptic dressing. The buboes in the groin and in the popliteal space were opened out latterly.

16,755. Did they suppurate?—Yes.

16,756. Had the man any other symptoms of plague?—The foot was swollen from one extremity to the other; it was a big swelling, hard and œdematous.

16,757. Had he headache?—Yes, and very strong delirium; he was senseless for three days.

16,758. Did you ever see bullæ in any other part of the body?—Yes, on the chest, followed by buboes in the axilla. I have seen it in the back followed by septicæmic enlargement of the glands—27 glands I should think.

16,759. Where were the 27 glands?—I distinctly counted 27 on the back and in the axilla. I have only seen one case of this kind.

16,760. Are these the only cases of bullæ that you saw?—I have in my notes three cases marked, one of which got well, and that person was inoculated.

16,761. Did you ever see cases of carbuncle?—Yes, three cases.

16,762. These are the same cases?—Yes.

16,763. You often saw paralysis after plague?—Yes.

16,764. Was the paralysis temporary?—Yes, that also.

16,765. What sort of paralysis was it? Was it anything like diphtheritic paralysis?—No, not diphtheritic. He could not articulate, and had great difficulty in swallowing.

16,766. Did you see paralysis of the limbs after plague?—Yes, and of the feet, and hemiplegia.

16,767. How long did that last?—It lasted for a month.

16,768. Did you ever see inflammation of the cornea?—Yes, very often, corneitis.

16,769. Very serious?—Yes.

16,770. Did the patients lose their eyes?—Yes.

16,771. Did you ever see paralysis of the larynx?—No.

16,772. Have you ever seen paralysis of the bladder, so that the man could not pass water?—Yes, I have seen that.

16,773. In men or in women?—In men.

16,774. How long did he stay without passing water?—He stayed three days.

16,775. Did he pass water ultimately, or did you have to use a catheter?—No, the man died.

16,776. Are you sure he had not a stricture or some other impediment?—I cannot say.

16,777. Did you ever see paralysis of the anus?—I have seen gangrene of the anus.

16,778. In cases of plague?—Yes, and gangrene of the coccyx.

16,779. Was that after the woman was recovering from the plague, or during the plague?—During the plague.

16,780. What day did it come on?—It was in the epidemic at Dholer. The case was being treated by another medical officer. I saw the case after him and began to treat it. The woman did not die of plague, but got cured.

16,781. Did gangrene begin before she had plague or after?—After she had the plague.

16,782. Was she paralysed at the time?—Yes; both the feet were paralysed.

(Witness withdrew.)

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Mr. Antonio Francisco Fernandez called and examined.

16,783. (*Dr. Ruffer.*) You are a medical practitioner in Daman?—Yes.

16,784. You hold a medical qualification?—Yes, from the Ahmedabad medical school.

16,785. How long have you been in practice in Daman?—For the last three years.

16,786. You acted as the medical adviser of the Parsee community?—Yes.

16,787. How many of the Parsee community were inoculated?—I cannot exactly tell the number, but all the numbers will be mentioned in Mr. Sorabji Manekji Damanwalla's evidence.

16,788. Were there not 61 persons inoculated?—The 61 are not only the Parsees. I mean the 61 were inoculated persons who were attacked with plague.

16,789. Out of the Parsee community?—Not the Parsee community alone, but in general.

16,790. Sixteen of these people died?—Yes.

16,791. And you also saw 34 uninoculated persons living in inoculated families?—Yes.

16,792. And out of these 22 recovered and 12 died?—Yes.

16,793. Are all these cases reported in Prof. Haffkine's and Major Lyon's report?—Yes.

16,794. What forms of plague did you meet with in the first epidemic?—The first form is the simple bubonic form; the second is the pneumonic form; and the third is the septicæmic form. In the last epidemic, besides these three forms, I met with a fourth. I do not know whether I can say exactly it is a fourth form of plague. It may have been a complication. It was accompanied by bullous inflammation on different parts of the body.

16,795. What were these bullæ like?—They are something like blisters.

16,796. Were they scattered all over the body?—In certain parts of the body.

16,797. What parts?—It generally affected the chest. It is something like herpes zoster.

16,798. Is it always on the same side as the bubo?—Not always.

16,799. Sometimes in another part?—Yes, I saw it even on the palm of the hand.

16,800. What did these bullæ contain?—First serous fluid, and then they became opaque, and then puriform.

16,801. Did you ever examine these bullæ for plague bacilli?—I have not the instruments.

16,802. You have no doubt that these cases with bullæ were cases of plague?—I have no doubt.

16,803. Why?—Because the train of symptoms which followed these bullæ were very much similar to plague symptoms.

16,804. What were the symptoms?—Headache, delirium, high fever, pain in the back, pain in the loins, sleeplessness, and vomiting.

16,805. Buboes?—Yes, and with buboes.

16,806. At what stage of the disease did you notice these bullæ?—About the fourth day.

16,807. In what part of the body were the bullæ most frequently found?—Generally over the abdomen and the chest.

16,808. Did you find them on the legs?—Yes.

16,809. Did you find them on the inner side of the thigh or the outer side?—On the inner side of the thigh. I found them also on the calves.

16,810. Did you find them in the arm-pit?—Never.

16,811. Did you find them on the face?—Never.

16,812. Did you ever find them over the bubo itself?—No.

16,813. Did you ever find them on the mucous membrane, such as the mucous membrane of the mouth?—No.

16,814. Or inside the ear?—No.

16,815. Or on the conjunctiva?—No, never.

16,816. Did you notice that the cases which had the bullous eruptions generally died?—When these eruptions appeared in the later period, I mean after the acute stage, it was a favourable prognostic sign.

16,817. Did you ever notice any evil after-effects from plague?—Yes.

16,818. What did you notice?—Complete blindness, deafness, dumbness, general paralysis, hemiplegia, paraplegia, and opacity of the cornea.

16,819. In typical cases of plague?—Yes.

16,820. Can you give us any instance of plague resulting in complete dumbness?—We have got an example.

16,821. Did the case of dumbness recover?—No.

16,822. Did the case of blindness recover?—No. There was complete disintegration of the orbits. The orbits were destroyed entirely.

16,823. Did the case of deafness recover?—No, he has not recovered.

16,824. What do you mean by general paralysis? Do you mean general paralysis of the insane?—Paralysis of all the four limbs.

16,825. Something like peripheral paralysis?—Yes.

16,826. Was it like what you get in diphtheria?—Not like that.

16,827. Is it like alcoholic paralysis?—I cannot exactly tell you.

16,828. Could the man walk at all?—He could not walk at all, and he could not lift his hands; his wrist dropped.

16,829. Could he raise his arm?—No.

16,830. He could not move his limbs at all?—No.

16,831. Could he flex his knees?—No.

16,832. Did the case of hemiplegia recover?—I cannot tell whether he has recovered or not. The man suffering from paraplegia recovered.

16,833. Have you notes of all these cases so that you can describe them to us in full, because they are very important?—Yes. (The following notes were afterwards supplied by the witness:—

Case No. 1.—Jinny Bangia, 7 years old, living at Katheria, attacked in April 1897—had bubo in the right groin, very high fever, and was unconscious for six days, after which she came to her senses, but with complete loss of speech—the tongue when protruded was extremely flabby and thick. Ten days after she recovered, but was completely dumb. Six months after she could mutter a few words, but these could not be understood. She is now able to speak more freely.

Case No. 2.—Daood Rahman Kashi, of Karwari (Lower Daman), aged 40, attacked during the first epidemic; had bubo in the right groin. At first there was complete loss of speech and motions of the upper and lower limbs; he lay helplessly on the bed. Deglutition was also difficult. This condition continued for four months. He is now at Bulsar, and I am informed that he is now able to speak freer and is able to move about the house with the aid of a stick. The function of the digestive and urinary organs was not impaired.

Case No. 3.—Lachia, a labourer, aged 35 attacked during the first epidemic; had bubo in the right groin; both suppurated; recovered, but with complete loss of motion of the lower half of the body (paraplegia); this condition continued for nearly a year and has recovered now without any medical aid.

Case No. 4.—Gopal Lalla Machi, aged 30, living at Katheria; attacked during the second epidemic; had bubo in the right groin and several bullous inflammations in different parts of the body. The head symptoms were very severe, and complained of pain in both the eyes; he recovered, but completely blind (disintegration of both the orbits). I cannot give more details of this case as it came under my notice long after his recovery. What I have said I gathered from information given to me by the man and a member of his family. The man is living and so also all other persons recorded here.)

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16,834. During the second invasion of plague, you were in charge of the Plague Hospital, were you not?—Yes.

16,835. How many cases did you treat there?—In the hospital only 26.

16,836. How many did you treat in your division in the town?—393.

16,837. How many of those had been inoculated?—19 in 1898.

16,838. How many were inoculated in 1897?—18.

16,839. How many of the uninoculated died?—Only 26 survived.

16,840. How many survived among the 19 inoculated in 1898?—Nine died and 10 survived.

16,841. How many recovered of the 18 inoculated in 1897?—I do not remember the figures.

16,842. I suppose you had the same sort of plague cases in the second epidemic as in the first?—Yes.

16,843. In 1898 you evacuated one street of Katheria?—Yes.

16,844. That is where the epidemic broke out, and you inoculated all the inhabitants?—Yes.

16,845. What was the result?—The result was that within 15 days there were no cases of plague occurring in that street.

16,846. To what do you attribute the good results; to evacuation or inoculation?—I cannot exactly tell, but I think it was due more to inoculation, because we commenced inoculating first those persons who were not in contact with plague patients, and after these people were inoculated we sent them to attend the plague patients while the former attendants were inoculated; none of these were attacked.

16,847. How many inhabitants had you got in that street?—About 400 people.

16,848. How many did you inoculate?—219.

16,849. Just about half and half?—These 219 are not in the street alone.

16,850. The great majority of people were not inoculated then?—That is so.

16,851. Then how can you attribute the stopping of the epidemic to the inoculation?—I cannot tell whether it was due to inoculation or segregation.

16,852. I thought you said you attributed it chiefly to inoculation?—To inoculation in the case of people who were in contact with plague patients.

16,853. The large majority of people remained uninoculated?—Yes, but they were inoculated subsequently.

16,854. How long afterwards?—I think about a fortnight afterwards.

16,855. After they had been turned out of their houses?—Yes.

16,856. How many persons did you inoculate from the 18th March to 5th June 1898?—219.

16,857. How many died?—One died.

16,858. How do you know no more than one died? Have you seen the 219 people again?—The records are in Mr. Sorabji Manekji Damanwalla's house. None of the inoculated people mentioned in my list died of plague.

16,859. Are they all in the city?—Yes.

16,860. How do you know they are all in the city? Have you been to look?—The people are few and I know most of them.

16,861. How can you know that 219 of your acquaintances have not left the city?—I was the only attendant at Lower Daman, and all the plague cases were brought to my notice, so that if they died I should be the first to know of it.

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16,862. (*The Chairman.*) Did you accompany Major Lyons in April 1897 when he went round to inquire what had happened to the inoculated people?—Yes, at Mr. Damanwalla's request, as I was well acquainted with the situation and each house.

16,863. Did he go round to every house in Lower Daman?—Yes.

16,864. Did he make notes regarding each house in Lower Daman?—Yes, he had a form which was filled up at the time.

16,865. Have you M. Haffkine's printed report?*—Yes.

16,866. How many inoculated people do these printed notes apply to?—I have my notes, but I cannot tell exactly the numbers.

16,867. If they apply only to something under 440, how do you explain that fact, considering that there were about 2,100 people inoculated? Do you know where the notes recording the remainder are?—Notes were taken only of those houses where plague cases occurred.

16,868. But did he not visit the houses where inoculated persons were not known to have been attacked by plague?—No. He did not visit those houses where no case of plague took place. The houses of inoculated families where no cases of plague took place were not visited by him, because inquiry into each inoculated house was previously made by Mr. Damanwalla.

16,869. Who told him which were the houses in which inoculated people had been attacked by plague?—I was with him.

16,870. You told him?—Yes.

16,871. How did you know which were the houses?—Because I had the list of all the persons who had died from plague with me, and I knew those people and I took him to those houses only.

16,872. Regarding the balance of some 1,600 or 1,700 inoculated people, has anybody gone to their houses to ascertain which of them are alive and which are dead by actual inquiry at the house?—That I do not know, but the full particulars are at Mr. Damanwalla's office.

16,873. I will take your own house as an instance. Did Major Lyons inspect all the people in your house?—No.

16,874. Did he visit your house?—No.

16,875. How many people were then living in your house?—Nine persons.

16,876. And of those how many have been inoculated?—All were inoculated.

16,877. Had there been any attacks among those nine inoculated persons?—No.

* *See* App. No. II., in Vol. I. of the Commission's Proceedings.

(Witness withdrew.)

(Adjourned till Saturday, 11th February, at Bombay.)

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APPENDICES.

APPENDIX No. XXV.

MAHAMARI IN KUMAUN.

REPORT

BY

SURGEON-COLONEL C. PLANCK,

AND

NOTE BY DR. WATSON,

Reprinted from the Annual Report of the Sanitary Commissioner for the North-West Provinces for 1876.

95. It will be necessary, for the more perfect understanding of this subject, to relate in a few words all that had been officially recorded with reference to this disease previous to the outbreak about to be described.

In February, 1836, while Mr. S. M. Boulderson, the Commissioner of the 3rd division, was marching through a part of his division, presumably Garhwál, the Tahsildár of Srinagar mentioned the prevalence of a disease in Garhwál, which, by his description, appeared to resemble plague; the disease having been particularly fatal in and about Karnpryág. For this reason Mr. Boulderson called for a report on the subject from the Commissioner of Kumaun. In submitting this report, under date 25th April, 1836, Mr. Gowan, the Commissioner of Kumaun, states that, according to the information of the Tahsildár (of Srinagar), the disease in question originated in 1823 at Kidárnáth, in the person of the Ráwal of the celebrated temple there, who having in that year deviated from the rules prescribed in the Shástras for the performance of the religious ceremony called "hom," was smitten with this new form of disease and died, together with the Brahmans who assisted at the offering. From Kidárnáth the disease appeared in the villages in religious assignment to the temple, and afterwards spread to other parganas of Garhwál.

As regards the outbreak in 1834–35, of which report was especially called for, the disease is described on the authority of the Revenue Officers as follows:—

"The appearance of the disease in a village had been observed to be preceded by a mortality amongst the rats of the village. The onset of the disease in man is described as sudden, attended with fever, great thirst, and an eruption of buboes or swellings under the arms and behind the knees, with a desire to eat bitter things. After the appearance of the swellings choleraic symptoms appeared, and the disease generally terminated fatally in the space of two, three, or four days, those who recovered being very much reduced for a long period."

At the date of report the disease was believed to have disappeared in Garhwál, after having caused an ascertained total of 633 deaths during 1834–35.

96. The next recorded official notice of this disease is dated 22nd December 1849, being a letter from J. Strachey, Esq., Senior Assistant Commissioner of Garhwál, to the Commissioner of Kumaun, bringing to notice an outbreak of Máhámari in certain villages of the Chaprákot patti in Garhwál. The disease is said to have made its appearance during the rainy season of 1849, and to show no symptoms of cessation up to date of writing. Mr. Strachey states that he has not the means for giving a detailed account of the nature of the disease, but thinks it sufficient to state the following facts:—

"For about 30 years past there has existed in Kumaun and Garhwál a disease known by the local name of máhámari, apparently identical with the plague of Syria and Egypt, the characteristic symptoms being violent fever of the most contagious nature, always accompanied with swellings in the armpit, the disease ordinarily seeming to reach its crisis on the third day after its first appearance in the persons attacked, no known remedies producing any good effect."

For these reasons Mr. Strachey proposes that an application be made to Government for the deputation of a competent Medical Officer to investigate the disease, and to suggest remedies and sanitary measures likely to check its progress. The letter concludes with a recommendation to the effect that the Medical Officer chosen should possess a skilful knowledge in medicine, combined with sound judgment and a determination to face a personal risk which may be by no means an imaginary one.

97. In forwarding this letter to Government for favourable consideration, the Commissioner of Kumaun, Mr. J. H. Batten, reports to the following effect:—

"That with regard to this outbreak of máhámari in Chaprákot, the real state of affairs is deplorable. That a village visited by máhámari disease is entirely cut off from its neighbourhood, owing to the belief the natives have of the contagious nature of the disease. Thus, when food fails, the people of the infected village, harbouring the forests and caves near their desolated houses, are obliged to go to their own barns for a supply, each visit renewing the frightful mortality among them. That this disease, which first commenced in the snowy range, is undoubtedly coming lower and lower every year. During 1837 Mr. Batten recollects it to have been alarmingly prevalent in Nagpur and Badhan in Garhwál. In 1846–47 it found its way to the sources of of the Rámganga and almost entirely swept away the population of Sarkot near Lobha, and also to a village near the source of the Kosilla in Kumaun proper."

In 1847 a village within 15 miles west of Almora was attacked.

In 1848 a few villages along the fatal line of the Pindar River were threatened with a return of the disease.

Mr. Batten points out that Upper India occupies the plague latitudes of the world, and is believed to escape from visitation of that disease only in consequence of the peculiar heat of its climate. And he dwells upon the fact that the portion of Upper India included in Garhwál and Kumaun, being from altitude a cool country, is not guarded from plague by that peculiar heat of climate.

Mr. Batten further records the opinion, that the disease in question only attacks certain localities where the inhabitants by neglect of sanitary laws have become predisposed to its attack, and that it attains to an infectious form after its commencement in such places.

In accordance with Mr. Strachey's request, and at the desire of Government, the Medical Board suggested that Dr. Renny, Superintending Surgeon of the Meerut Division, should be directed to inquire into the history and nature of the disease.

98. Dr. Renny was therefore directed to proceed to the locality of prevalence, to make the necessary investigation and report the result.

Dr. Renny accordingly, after local investigation, submitted to the Medical Board, under date the 19th August, 1850, a paper entitled 'Notes for a Report on a disease called Máhámari or Great Plague," the paper being accompanied by extracts from Dr. Renny's Journal of Proceedings.

The extracts show that the local investigation commenced at Duddoli village on 9th May 1850. Here much of local information and belief concerning the disease was gained, but no case seen. On the 10th May two cases were seen, and the symptoms recorded; on the 13th May two cases were seen. From the 14th to 18th May much local information was recorded, but no cases of the disease could be discovered, and on that

date the local investigation terminated, as the prevalence appeared to have subsided in that immediate neighbourhood.

As the result of the investigation Dr. Renny recommended to the local authorities, in a letter to Mr. Strachey, dated 14th May 1850, that every house in which máhámari attacks one of the inhabitants should be burnt down, and that the people should be forced to burn or bury the bodies of those who die of máhámari.

In his notes for a report, Dr. Renny states that of necessity he saw the disease on a very small scale as to time and number of cases. But from what he saw, and the information he gathered, he had formed the opinion that máhámari is a malignant fever of a typhus character, accompanied by external glandular tumours—a very fatal disease, generally terminating in death within three or four days of attack. That it appears to be infectious, but not contagious. That the appearance of the tumours or buboes is an unfavourable symptom. Dr. Renny insists that the disease is not plague, but simply a malignant typhus, infectious, but not contagious. By not contagious he explains his meaning to be, not communicable by direct or mediate contact. Seeing the almost total failure of present treatment, he thinks attention should be turned to means of prevention.

These he thinks are—1st, removal of the sick instantly from the healthy; 2nd, the disinfection of the houses by fire; 3rd, the lime-washing of all houses of an infected village inside and outside; 4th, the immediate removal of the bodies of those who have died of the disease; 5th, the removal of the manure heaps from the immediate neighbourhood of the dwellings.

Lastly, Dr. Renny states that he will propose a plan to the Medical Board for supplying medical aid to the district in the event of the disease again breaking out, as by this means the disease may be carefully observed, its proper treatment discovered, and erroneous views taken in the "notes" corrected. The plan submitted was the location of four or five medical officers, with suitable allowances from the Civil Department, around any infected tract, to trace out and relieve every case within their circle of observation.

99. In accordance with the recommendations of Dr. Renny, the Government sanctioned the carrying out of measures for the removal of manure heaps, and directed that, on the breaking out of the disease in future, native officials should be employed to burn the bodies of the dead, and destroy the less valuable of the infected houses, compensation being awarded to the poorer class of sufferers. And immediately that the prevalence of the disease had been ascertained with certainty, the employment of a medical officer, who would receive the allowances of a Civil Assistant Surgeon, was approved. The officer appointed to be despatched to the locality of disease for its study, and to afford such aid as may be possible to the sufferers.

100. The recorded mortality from the outbreak of 1849-50 was 103 deaths in nine villages.

101. Máhámari disease continuing its prevalence in 1851, in October of that year Dr. Pearson was deputed, in accordance with the above orders, to investigate and report upon the nature of the disease, being accompanied and assisted during the investigation by Sub-Assistant Surgeon Srinath Mukerji.

From the information gathered, and from personal observation, these officers in their joint report, dated 1st December 1851, express the opinions that máhámari is a contagious and infectious disease, considering both words as synonymous. That the predisposing causes are—personal filth, and filth in and around the dwellings of the people, poverty of food, and fear of the disease. That the exciting cause is contagion. That the most hopeful remedial measure would be the removal of the predisposing causes.

As to the nature of the disease, they put forward a few remarks, founded principally upon native evidence, carefully collected, to the effect that máhámari is simply typhus fever, assuming a rapidly fatal character from the peculiar predisposition of the people; that the suppuration of the buboes is a favourable symptom; that rats have been frequently found dead in the affected houses; that although as yet the disease has hitherto been endemic, there seems no reason why, under existing circumstances, it should not become epidemic.

102. The disease still prevailing in 1852, April and May, the same two medical officers were again deputed for its investigation. And in their report dated 17th May 1852, record the opinion, as the result of the actual treatment of four cases, and of more extended observation, that the disease is *plague*; that suppuration of the characteristic swellings is a favourable symptom; that the disease is propagated solely by contagion.

103. Deaths from the disease still occurring, and its infectious nature being recognised, in August 1852, it was deemed expedient to appoint two medical officers, Dr. Francis and Dr. Pearson, to act in conjunction for the study and prevention of the disease.

During the years 1852–1853 these officers were actively engaged in the study of the disease and its treatment, and in their report submitted to Government they record the opinion that the disease is *plague*. These officers saw many cases of the disease, and recorded the *post mortem* appearances in four cases, the chief diseased conditions observed being congestion of internal organs, specially of the brain, a diseased condition of the blood, and effusion into the serous cavities.

They believed that its appearance was due to insanitary conditions in and around the dwellings of the people, and its great prevalence in any village due to the intensely infectious nature of the complaint. They considered that its proper remedy was sanitary reform in the villages.

104. In consequence of this report, during the years 1854–1857, Dr. Francis and Dr. Pearson were employed chiefly in directing and enforcing measures for the improved sanitary condition of the villages generally in Garhwál and Kumaun. I think this important work was principally effected by Dr. Pearson, who has kindly placed his journal of a portion of this period at my disposal. From it I learn that the measures insisted upon were—the better ventilation of the dwellings by the making of windows, the removal of the cattle from the dwelling-houses to cowsheds erected at some distance from the village, the maintenance of cleanliness throughout the village site, the clearing of jungle from the neighbourhood of the village, the discontinuance of the cultivation of hemp crops anywhere within the habited site, and the whitewashing, either with lime or clay, of the interior and exterior of the dwellings.

The entries in Dr. Pearson's journal witness to the reality of the improvement effected in many hundreds of villages, and I think it is probably true that during the years under consideration the sanitary aspect of every village of any importance in Kumaun and Garwál was greatly improved. During those years there is no record of máhámari prevalence. It is likely that the sanitary improvements were most real and general in Garhwál, where Mr. Strachey entered very heartily into the work.

105. During 1857-58, the period of Mutiny trials and experiences, it is probable that the newly-established sanitary measures were neglected; however that may be, it is certain that in September 1859, Dr. Pearson was invested with the powers of a Deputy Magistrate in Kumaun, to enable him to enforce his orders in carrying out the sanitary measures necessary to check the máhámari fever which had broken out in the northern parganas, and in 1860 it is reported that close upon 1,000 persons died of the disease. From 1859 to 1875 Dr. Pearson, who had also been appointed Sanitary Officer of Kumaun and Garhwál, continued his labours at intervals for the improvement of the sanitary aspect of the hill villages, with a great amount of success as regards the prevention of máhámari disease, of which I can trace official mention only in 1865, when the Commissioner of Kumaun sanctioned rules to be in force in combating such a calamity as máhámari, and in 1870, when an outbreak of máhámari at Sarkot, which commenced on the 20th of September, and continued till the 9th of November, is reported by the Senior Assistant Commissioner of Garhwál.

For a considerable number of years of the period last mentioned, Dr. Pearson has held the additional appointment of Superintendent-General of Vaccination for the North-Western Provinces, and it is not unreasonable to suppose that he cannot have been able, during recent years, to devote so much time and attention as formerly to the maintenance of good sanitary conditions in the villages of Kumaun and Garhwál; and to this cause it may be due that in many of the villages I have recently inspected, the sanitary measures he laboured so earnestly to establish were either non-existent or little apparent.

106. My own duties with reference to this disease commenced on the 20th January 1877, as previously recorded, in obedience to the commands of Government, by which I was directed to proceed without delay

to Kumaun to assist the Senior Assistant Commissioner in carrying out the sanitary measures necessary for the prevention of the further spread of the disease; and after that was effected to report concerning the epidemic to Government, and especially to explain whether the sanitary rules prescribed for checking this disease 20 years ago had been duly and constantly observed.

These orders were issued in consequence of the report of the Commissioner of Kumaun that máhámari disease had been a good deal prevalent during the months of November and December 1876, in certain villages of Kumaun, and the Commissioner's recommendation that a medical officer should be deputed to carry out the necessary sanitary measures as requested by the Senior Assistant Commissioner of Kumaun.

107. In writing the history of this outbreak of disease, I propose in the first place to record its local history in every village attacked, and then to record such general remarks as the histories appear to warrant, coupled with such information as may be learnt from any available source of information.

108. The villages attacked in this last outbreak may be divided into the following groups:—

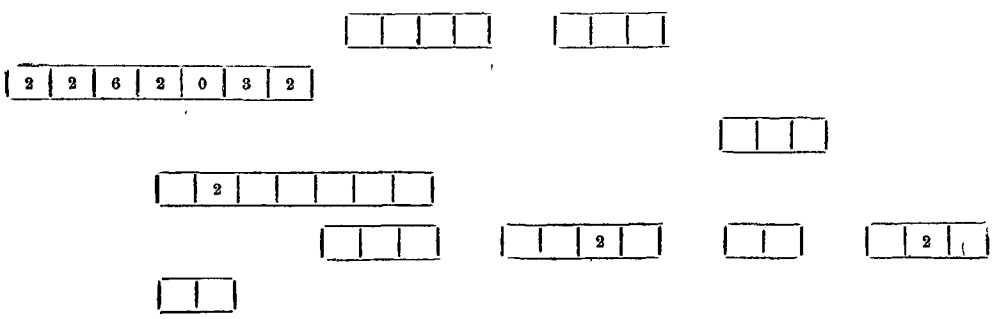
Parganas.	Villages.
Khás Párja	Bált. Bintola. Sirár. Nainoli. Gajula. Salla. Biraura. Maichor. Mátoli.
Bora-ki-Ráo	Baunri. Tanda. Sajoli. Phaliánti. Cháin. Behta Talla. Kausani. Kajuli. Mangálta. Ajula. Tailihát. Kúrúráh.
Attárgoli	Bhándárgáon. Dúgora.
Dánpur	Parsáli. Sungárh Báret. Naukoti. Sama. Bándhár. Gaulá. Bhámáugáon Dor. Chachéna. Birtáng. Dárkot. Alám. Bothi. Básánkot. Kásiábará. Gásdéra.

Bált and Bintola.

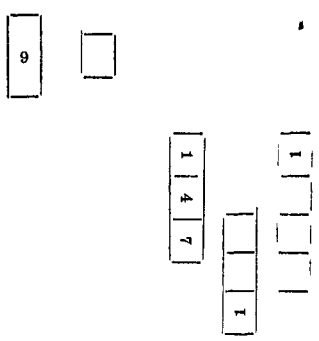
First inspected on the 21st January 1876.

109. *Bált* and *Bintola* are two adjoining villages situated rather low down in a valley about four miles north-east of Almora town. The houses are well built of stone, with solid roofs of thick hill slate. They are arranged in short terraces on the hill side, in accordance with the following ground plan, Bintola being lower placed than Bált. In the plan each square represents a house, and the figure the number of deaths which occurred in the family inhabiting the house.

Bált.



Bintola.



The people of Bált and Bintola are friends; they have intermarried, and relatives of many families live part in Bintola and part in Bált, and for the purposes of this inquiry the two villages may be considered one.

110. Máhámari disease first appeared at *Bintola* early in November 1876, in the person of a child of the padhán or headman of the village. This child had never been out of the village since it was born, and no stranger had visited the village for some months before the child was taken ill. The child died on the third day after it sickened, and while it was sick two other children of the same family were taken ill, and also died. In the two houses which formed the homestead of the padhán before the sickness commenced, there resided a family of 14 persons in all. Of these 14 persons, 13 died at intervals during November and

December, all with the same symptoms of disease, commencing with shivering, quickly followed by intense fever, ending in delirium, insensibility, and death on the third or fourth day.

In the terrace of three houses adjoining the padhán's home three families resided, containing a total of 14 persons. The women of these families helped to nurse the sick of the padhán's family, and during November and December 12 of these 14 persons died of the same form of disease.

At first the sick were nursed and died in the houses, afterwards the sick were nursed and died in temporary huts outside the village, and all the bodies were buried after death. In all, 31 cases of the disease occurred during November, December, and January, and 27 persons died. The four persons who recovered presented themselves to me on the 24th January for examination. All had the same appearance of extreme debility with emaciation, and one had a small bubo in the left axilla, which appeared on the sixth day of his illness seven days ago, and is now soon likely to suppurate, being hot and tender. (It did afterwards suppurate, and the man perfectly recovered.) Bubo was noticed both in the axilla and inguinal region in some other of the later cases, but in none of those who died quickly at the first outset of the disease. And it was only after the buboes were seen that the people knew they were suffering from an outbreak of *golá*, the name given by the hill people to the disease of which I write, *máhámari*, meaning *pestilence* of any kind. No appearance of bubo occurring in the first rapidly fatal cases, the people thought the disease was *sanjar*, a form of continued fever common amongst the hill people and frequently fatal, but believed to be less contagious, and therefore less dreaded than golá. Consequently they continued to reside in their houses and carefully nursed the sick, and even sent for a holy man from Almora to pray for them and sacrifice to Devi, for which he was well paid. When the buboes appeared the Gosain left, and the people vacated their houses. From the time the people vacated the site, to live in temporary huts or in caves on the hill side, only one death occurred, as will be hereafter described.

111. In *Bált* the first case occurred in the person of a woman named Báni, who had gone to the padhán's house at Bintola to assist in nursing the sick children there. She resided and died in one house of a terrace of seven in the upper part of Bált, next her daughter died, then four persons died in the adjoining house, then her husband died, and the disease spread through the terrace, so that deaths occurred in every house excepting one which was untenanted. In all, 13 persons died in the terrace during December, and then, as at Bintola, the people of the villages vacated their houses so soon as golá or bubo was noticed as a symptom of the disease in those who lived beyond the fifth day. Indeed, deaths from golá being reported, the civil authorities directed the people to vacate their houses, and they located themselves in huts of grass and branches on the hill side. All remained well until a great fall of snow occurring on the 14th January the people returned to their homes, and during the succeeding five days four more deaths occurred in the houses of the terrace previously affected. The people, seeing this return of sickness, fled at once to the hill side, leaving the sick, who died unattended in the houses.

At my first visit of inspection, on the 21st of January, the local conditions at Bált and Bintola were as follows:—Both villages were uninhabited; the former inhabitants scattered in families miserably lodged in huts or caves far off; the village cattle roaming and feeding amidst the young wheat of the cultivated terraces around and below the villages; the torn remains of 13 cows, calves, or bullocks, and five goats, scattered in different places, witnessing to the truth of the local statement that, from dread of the disease, no one dare venture on to the site to house the cattle as night approached, and that consequently leopards and hyenas were killing them.

The well-built houses were seen to be double-storied, one room below and one above; close, unventilated tenements. The lower room used only as a cow-house, the upper room for family occupation.

In the lower room, about five feet high, it had been customary to lodge from four to eight head of cattle or goats at night, and, indeed, in some instances as many as the room had standing place for; the only opening being the small doorway of entrance, tight closed and barred at night.

These rooms were seen to be littered for about a foot in depth with little decaying straw and much manure, moistened by the fluid excretion of cattle, and the entrance way on each side, and the stone platform facing the lower story, were piled with heaps of manure, which had been drawn out of the lower room as necessity required, and there left for eventual removal to the land in the ploughing seasons.

The upper room was noticed to be roughly divided by wooden slabs into a front and back portion; the former used as the family sleeping place; the latter as a granary; the doorway, and in some instances a round hole in the front, and a small round hole for the exit of smoke through the roof of the house, all commonly closed at night, being the only openings. The floor was made of thin wood, with pretty numerous cracks, so that the warmth generated by the cattle below could reach to the sleeping people above. Afterwards locally described as a beneficial arrangement, for no man would go with me into the villages at this time.

The previous description especially applies to the houses of the infected terrace in the upper part of Bált, and is generally true of all the houses of the village, of which I closely examined every one.

Upon the stone platform facing the terrace above mentioned lay the broken remains of the four persons who had last died; their limbs and skulls torn and scattered by jackals—a grievous sight.

112. As regards the site generally, and the precincts of the villages, nothing of insanitary aspect could be seen. With the exception of a grove of pine trees at one place, the sharply sloping surface was clear of excessive vegetation everywhere. A mountain stream of bright water, flowing between the village sites, furnished an ample supply of good water for domestic purposes. Above the village sites all was clear, open, rocky ground; around and below the sites almost all the surface had, by the patient industry of many years, been fashioned into narrow terrace fields, spreading down in green steps of young wheat and barley to the margin of the rocky stream flowing in the very bottom of the valley. In short, the surrounding conditions were clear, clean surface, bright flowing water, sweet air everywhere; all of unwholesomeness the site contained was gathered within and immediately around the habitations, or in the close neighbourhood of the dead cattle.

113. During the inspection, the results of which are recorded above, the remaining population stood far off in groups on the hill side anxiously watching proceedings. The inspection completed, I rejoined the principal heads of families to appeal for help for the disposal of the remains scattered on the terrace platform. The result was unfavourable. No help could be given for any consideration whatever; but advice was tendered by the padhán, and at first acquiesced in by all, to the effect that, as the houses would never be re-inhabited, it would be well to burn the terrace down. It was explained to me that early in January the houses of the terrace had, by order of the civil authorities, been disinfected by burning sulphur in them; but that notwithstanding this precaution, more deaths had occurred there after the people returned to their homes in the snowstorm. Therefore the general opinion was that the houses had better be entirely destroyed, as also the houses of the padhán in Bintola. To this arrangement, however, the expectant heirs to the property in question eventually objected. In many cases these heirs were very distant relations indeed of those who had died. In some cases they had left their relations to die alone, and to be eaten by wild beasts, conduct locally esteemed to merit forfeiture of heirship rights. But they being legal heirs, whose right senses had been overcome by fear, it seemed to me just to promise them that, until compensation could be ensured, no property should be destroyed.

114. With regard to the neglected remains, the local opinion was that they should be left where they lay, as the jackals would eventually draw them down into steep places and eat them up. No tools could be lent to dig a grave for them, and to burn them was considered objectionable, as likely to spread the disease by means of the smoke produced.

As I deemed it essential, for several reasons, that these remains should not be drawn about the village site by jackals, but be safely disposed of without delay, I was glad to be able, after considerable unpleasant labour, to draw them together and consume them with a great pile of wood gathered from different parts of the village; being ably assisted in the work by Músa, a brave man who formerly assisted Dr. Pearson in his

labours for the prevention of golá disease, and had been attached to me in a like capacity. As Músa served me faithfully and fearlessly during all the time of the inspections about to be described, I take this opportunity of stating the fact, and of recording my sense of obligation for aid in many a trying scene to this generally quiet but efficient man.

115. For the next few days my time was employed in the study of the disease in other villages of this group, and in frequent visits to the people of Bált and Bintola, with the special object of relieving to the utmost possible extent the misery of their condition, scattered as they were during inclement weather on the hill side, and cut off as they were from their stores of food which had been left in the houses, and which they dared not venture to approach.

By the willing aid of the civil authorities a supply of new clothes and blankets was provided. The old clothes and blankets of all surviving members of families in which deaths had occurred were gathered in a heap and burnt. All women and children and poor people generally whose clothes were ragged were re-clothed and presented with a blanket, on condition that the ragged clothing and thin old coverings should be burnt. A supply of food, to be provided by the neighbouring villages at stated intervals, was arranged for. At the same time the already existing quarantine, by which the people were prevented from going beyond their village boundaries, was maintained.

This order was advantageous only as preventing the people from visiting the town of Almora. For, as regards the neighbouring villages, the news of the prevalence of gola disease in Bált and Bintola having spread abroad, no person of their population would have dared, under risk of immediate violent ejection, to have passed within a neighbouring village boundary. An illustration of the strictness and reality of this locally established quarantine will be given in the Sirar history about to follow.

116. Having received the necessary sanction for the promise of a reasonable compensation for property destroyed—a sanction immediately accorded by the Commissioner of the division—as also to all necessary expenditure for new clothing and blankets—on the 29th of January I burnt down the infected terrace in Bált and the padháns' houses in Bintola, and also all the temporary huts in which some of the dead had been nursed. At the same time wood was heaped over the shallow graves in which some of the dead had been buried in the village site and burnt. All cotton and woollen things in the other infected houses were brought out and thrown into the burning houses. On the day this efficient disinfection was carried out, a man of Bintola, who had lived in one of the infected houses during the time of snow, was taken ill. I saw him 12 hours after his illness commenced.

He lay alone in a field at the entrance of a grass hut, crouched in a heap under a blanket, and almost insensible. His pulse 150, eyes yellowish, body trembling, not able to understand a question, just able to sit up quickly, to sink down again with his face to the ground. A man evidently suffering from an overpowering poison, from the effects of which he was going to die. Before his friends fled they had placed a wooden vessel containing water near him. A little of this mixed with brandy seemed the most hopeful form of remedy; but the dying man would take nothing. A few hours afterwards he was found dead, his friends consented to dig a grave, and he was buried. There was no appearance of bubo anywhere on his body, those characteristic swellings not appearing until the fifth or sixth day of the disease, as will be seen hereafter.

117. After the date of the disinfection by fire, all the people remained well at Bált and Bintola until the 1st of March, and had begun to look cheerful again. On that date the son of one Tejua, of Bált, who lived with a family of six persons in all in a small cave, was taken ill. His symptoms were, when seen about 12 hours after the attack commenced, skin hot, pulse 120, tongue grey, but clean, head painful, eyes suffused, intellect dull, strength prostrated. The alarming symptom was the pain in the head, pointing to congestion of the brain; cold applications were wrapped about the head. On the third day the boy was insensible, on the fourth day a glandular enlargement appeared in the armpit, and in the groin, which increased in size during the fifth day, and on the sixth day the boy died. During his illness he was carefully nursed by his father, the other members of the family remaining near the cave. The father buried the body after death near the cave, and then the family fled away to a grass hut at another place in the village boundaries. The day after the son died the cave was filled with dry wood and straw, and thoroughly burnt out with all contents of rags and coverings. The remaining members of the family were taken down to the stream, made to strip and wash. Their old clothes and blankets were gathered into a heap and burnt with wood and straw, and new clothes and blankets given to them. For many days they lived in a state of intense fear and depression, especially Tejua himself, a strong man of 50, who at times cried like a child at the thought of his trials and his family's sufferings, but hope returned as the days passed, and all the family were in good health at the end of June.

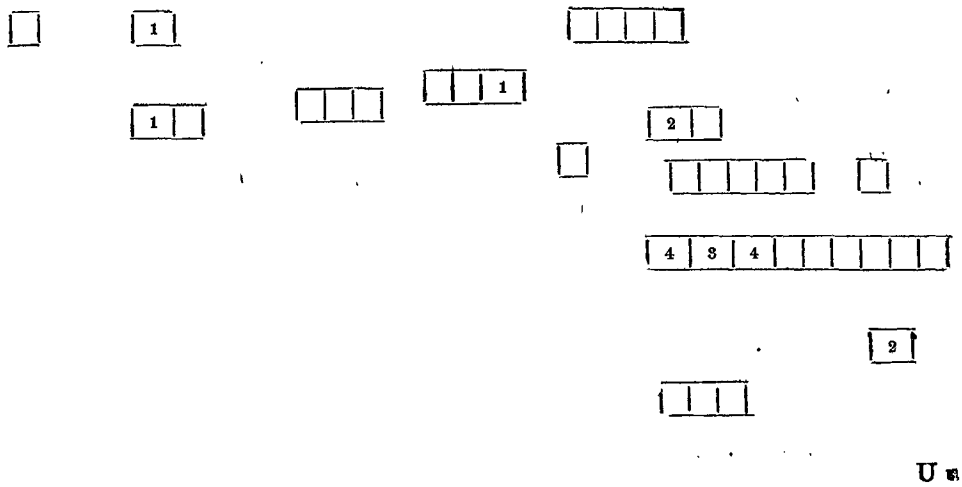
118. I should add that there can be no doubt, as the result of the concurrent testimony of many persons, that early in November many rats died in the houses of Bintola. It was stated that as many as four in one morning were swept from the upper floor of a house; and it was also said that certain children, all of whom have remained well, as a matter of pastime, cooked and ate one or more of the rats so found dead.

Sirar.

119. Sirar is a large village about four miles east of Bált and Bintola. The houses, well built, after the Bált and Bintola plan, stand upon a spur of rock jutting into a narrow valley. The spur, sloping quickly to the eastward, is cultivated in terraces from the top to the bottom, where the usual clear stream runs.

The following is the rough ground-plan of Sirar:—

Sirar.



The figures denote the cases or deaths from máhámari disease which occurred in the family inhabiting the house.

120. At my first inspection of this village on the 28th of January, the insanitary appearances described in regard to Bált and Bintola were seen to be equally present here. Two separate cow-houses, which had been built in previous years, had been allowed to fall into ruins, and the custom of housing the cattle in the lower rooms of the habitations was in full force here, with the usual result of extreme filthiness below and around the houses. In no other respect could anything unwholesome be noted within or around the site.

The history of the outbreak of golá disease was thus given by the padhán of the village in the presence of many people who acquiesced in the correctness of his statement.

In the month of November a boy of 15, named Keshrua, went to Bált village to fetch wheat for seed. He remained one night at Bált, sleeping in a house in which a woman was ill with golá disease, believed then to be sanjar disease, as before described. Fifteen days after Keshrua came home again, his little sister was taken ill with continued fever, and died after three days' illness; while she was ill Keshrua was taken with the same form of disease and died. Five days after Keshrua died his little brother sickened and died. Ten days after his death the father, Usup Singh, a noted wrestler and the strongest man in the village, was taken ill. While ill, a young daughter of his 14 years of age, and, only just gone to live with her husband in a neighbouring village, came home again expressly to nurse her father, who died on the sixth day after his attack commenced. He was also nursed by his brother Dhan Singh, who carried Usup Singh's body outside the village and buried it. A few days afterwards Dhan Singh was taken ill and died, and the last person who had died before I inspected the village was Dhan Singh's daughter.

Of these six persons who had died swellings were noticed in three, both in the neck and groin, and when they were noticed the people of the village fled out on to the hillside, and remained there in huts and caves, excepting the Usup Singh and Dhan Singh families, who remained and died in their houses, nursing the sick and burying those who died.

Of these two families there remained at the time of my first visit Usup Singh's wife and three children, who had vacated the family residences—three houses at one end of a terrace of nine—and were living in a grass hut in a field below the terrace. No person of the village would approach them, and they were spoken of as doomed to die soon,

The padhán and other principal persons of the village desired that the three infected houses should be burnt; and they would have been burnt at once, but for the violent conduct of a third brother of the same family, named Ganga Ram, who owned the corner house. This man, a well-known Government servant, employed as jemadár of coolies at Almora, had taken leave to join the family and look after his property in this time of trouble, and would not hear of his house being destroyed. Sitting in the doorway, axe in hand, he said if the house was to be burnt he would be burnt with it. He was willing to assist at the burning of the two houses so long as his own was spared. With infinite labour the two were burnt and the corner house spared.

121. On the evening of the same day (28th January) the clothing and blankets of the remaining woman and three children were burnt, and new clothes given to them; a better hut was made for them, and straw for bedding supplied. Food, water, and fuel were placed in the hut, and a dose of quinine administered to each of them. At this time, as the mother was noticed to have an anxious look, with other appearances of approaching disease, an old woman with a great goître, and aunt of the children, was induced by a gift of clothing and food to join the party.

On the 30th of January the mother was found ill of the prevailing disease, the children and aunt having fled away from the hut. The symptoms of the mother were those of continued fever, with congestion of the brain, and utter prostration of strength. She had been seriously ill for about 15 hours, was unable to sit up, lying upon her face in the straw. She could neither eat nor drink, or be persuaded to take any medicine. The aunt and children were found in one of the village fields crouched against a wall overcome by fear. A new hut and fresh food were provided for them.

On the 31st of January the mother was found dead, lying on her face as before. No appearance of swelling could be found upon her anywhere. With great difficulty the villagers were persuaded to bring wood and fire to a field neighbouring the hut, and that effected, they all fled up the mountain side and over the watershed. With the assistance of a chaprasi, then new to the work, the wood was piled in the hut until it was full; that effected, and handing a blazing wisp of straw, the chaprasi fled away after the rest. The resulting fire, however, was fierce enough to destroy the body.

The aunt and the children were bathed in the neighbouring stream and new clothes again given to them. Their former new clothing and blankets, and all the clothing and coverings of the dead woman being burnt in the fire of the blazing hut.

122. During the first week of February these four persons remained well. The weather having become extremely inclement, with continuous rain or snow, the poor creatures unable to bear the cold and misery of a hut life, crept into the lower story of Ganga Ram's house, which had been spared. On the 6th of February I found them there, the youngest, an infant, asleep on a manure heap in the doorway. On the 8th February this infant was taken ill and died insensible on the 10th. On the 8th February also, while still inhabiting the same house, for the ground outside was covered with snow, the aunt and the girl who came to nurse her father were taken ill. Seen on the 10th, the symptoms in both cases were those of continued fever. Doses of brandy and quinine were administered to both. On the 12th, the girl had a quick pulse, clean tongue, hot skin, clear intellect, and in her left groin a glandular enlargement, tender on pressure. The old woman, a quick pulse, coated tongue, hot skin, clouded intellect, and a boil-like swelling on her left eyebrow. Both able to stand up and talk, eat, and take medicine. On the 13th the old woman became delirious and died insensible: but the young girl, progressing favourably, was convalescent on the 14th, and again resumed her duties of feeding and tending the remaining child, her curly-headed brother, five years old. Her glandular enlargement suppurated on the 20th, and she perfectly recovered, and was, I think the means of saving her brother's life. Of all this formerly prosperous and respectable family, this boy alone escaped an attack of the disease, and, but for his sister's recovery, he, too, must, I fear, have died from neglect, for by no possibility could I get any person to approach the children after the aunt died.

The body of the infant who died was thrown down a steep place by the aunt and eaten by the jackals. The aunt's body was buried in a field below the house, as no help could be obtained for the carrying of the body, and no fuel to burn it.

123. To return to Ganga Ram and his family. At the time his house was spared he had promised that no one should enter it for two years if I would spare it. Nevertheless, he permitted his son, a boy of 13, to go to the house morning and evening to loose and confine the cattle which were housed in the lower room. On the 2nd of February this boy was taken ill with symptoms of continued fever, and died insensible on the 4th without appearance of bubo. From that date the cattle were allowed to roam at night, and the children of Usup Singh's family inhabited the room, as described above.

Ganga Ram nursed his son in a hut on the hillside, and after the son died, and he had buried him, he returned to the village and lived for a few days in a house above the one which had been spared, and which, having become reckless, he often visited. Ten days after his son died he himself was taken ill, and died on the third day, while I was absent at Dugora and Bhandargaon.

Before his death he sent for certain doms, low caste men, who lived in three lowest placed houses of the village, and directed them to remove the roof of the house which had been spared, so that the beams might be saved, as he had said that if he died the house might be burnt. For this service he gave the grain in the house to the doms, who unroofed the house accordingly

and took the grain—principally rice and mádhuá—down to their own houses.

124. On the 27th of February a widow woman named Khemuli was attacked with the disease. She had been in the habit of fastening her cattle every evening in the room below her house, No. 4 of the infected terrace, and unfastening them in the morning; she herself residing in a detached house near to the dom quarter. I saw her on the 5th March, and noted the following particulars:—Pulse No. 120, no pain, quite sensible, very weak, has a large boil-like swelling in the right axilla, and a glandular enlargement in the right groin. Quinine and brandy given to her. On the 8th March her condition was—pulse 100, eating dál and rice, getting well. Boil-like swelling in the right axilla broken and discharging white pus; glandular enlargement in the groin decreased in size. Has a puffy swelling of considerable size on the back of the left arm, not seen before, but which commenced to form on the seventh day of her illness. The swelling has a doughy feeling, but does not fluctuate. On the fourteenth day of her illness, namely, the 12th of March, Khemuli was found convalescent, the swelling on back of left arm broken and discharging pus, and she eventually recovered. On this day her clothes and blankets were burnt, and new clothes and blankets given to her.

During her illness she had been nursed by a young woman named Lachmi, who slept in the lower room of the same detached house. On the 13th of March Lachmi was taken ill with symptoms of continued fever, commencing with shivering. On the 14th she was delirious; on the 15th she died insensible, without appearance of bubo or swelling anywhere. Her husband, named Bachia, carried Lachmi, while sick, on his back to a cave near the detached house, nursed her in the cave, carried her body in his arms and buried it after death.

With the sanction of the owner the detached house was burnt, the cave burnt out with straw and wood, all clothing and coverings belonging to the dead Lachmi and Bachia were burnt and new clothes given to Bachia, who did not take the disease. No other case occurred in that neighbourhood. Although carefully watched for, no case occurred amongst the dom community proper, who, at my request, burnt all the grain taken from Ganga Ram's house, and threw back the wood of the roof into the house when it was burnt.

125. On the 27th of February also another widow woman named Mali was taken ill. She had two sons, whom she had sent away to a neighbouring village immediately after the suspicion arose that golá disease was present in Sirar. She herself remained for the care and protection of the family property, and specially the cattle, which she fastened every evening in the lower room of her house, No. 5 of the infected terrace; sleeping herself in a hut on the hill side far from the village with other people, her friends and relations.

Upon her attack with disease, these fled to another distant spot in the village lands, leaving Mali alone in the hut; a supply of water and food being placed near her. I saw her on the fifth day of her disease. During the five days she had eaten nothing, and the following symptoms were noted:—Has great pain in the head, is rather deaf, nervous energy gone, drew herself with difficulty to the door of the hut; but cannot sit up; pulse 150, strawberry tongue, drinks water occasionally. Lies on the bare ground covered with a blanket. No appearance of bubo or swelling anywhere; quinine and brandy were administered as medicine; a bed of straw was provided; sugar and rice provided as food.

On the following day her symptoms were—pulse 120, pain in head much less, tongue grey, sordes on the teeth, extreme debility, no bubo. On the 8th of March her symptoms were—pulse 120, tongue clean (reddish), skin hot. States that for the first two days of her illness she had frequent vomiting; has had no diarrhœa; bowels moved about once in two days. Is able to sit up; picks at straws on the ground; still a little pain in the head; talks sensibly; eats rice and sugar occasionally; no bubo anywhere. A clean sheet, new petticoat and blanket given to her; old soiled clothes and coverings burnt. Brandy and quinine administered and tea supplied.

On the 10th of March her symptoms were—pulse 140, skin hot, intellect clear, breathing rather quick, with a little cough, eats sugar and rice, bowels moved once since the 8th, very weak, picks at straws, has no bubo. On the 16th of March her symptoms were—pulse 120, eyes dull, sits up well, takes tea and sugar and rice, tongue moist, grey, no cough; says she wants nothing; appearance of bubo in the left groin.

This woman continued to mend slowly, but her life was nearly lost owing to neglect. Her relations called to her every morning from the hill side, and when they knew she was alive, left rice and gur and water at a little distance from the hut and then ran away. The woman slowly crawled to the food and back again. Night and day she lived alone, and, excepting at the time of my occasional visits, never conversed with any person. The bubo in her groin slowly increased until it formed a reddish shining tumour as large as a small orange, which broke and discharged matter.

On the 16th of April her symptoms were—pulse 90, tongue clean, has an abscess in the groin discharging yellow pus. Is convalescent, but very feeble; her hair and clothes infested with lice, which prevent sleep. After long waiting for scissors her hair was cut off close to the scalp. The honeycombed scalp was cleared, her clothing changed; the hut, old clothing, and hair burnt together. Before the hut was well ablaze, the poor woman was stretched in deep sleep under her clean sheet in the warm sunlight. A new hut was provided for her at a more convenient place, and her recovery was soon perfected. Of the four men who carried her on a pole up the hill side to the new hut, one is reported to have since died, and, I believe, correctly; but I was otherwise employed at the time of his illness, and know nothing of the particulars.

126. On or about the 25th of March during my absence, a boy who lived with his father and sister in a separate grass hut on the hill side was taken ill. The boy had been used to go daily to fasten up the cattle in the lower room of a house just above the infected terrace, and to take food from the house for family use. On the second day he was delirious; on the third day he became insensible and died. His father nursed him tenderly in the hut, and three days after the boy died the father was taken ill, and also died on the third day. No bubo appeared in either case. The hut was burnt with its contents on the second day after the father died. The daughter was reclothed on the same day; her old clothing and blanket burnt. On the 16th of April she was found well. She stated that she had remained in the hut during her father's illness, but at his request had remained apart from him. The girl did not, so far as I know, suffer from the disease.

127. These were the last cases of the disease which occurred at Sirar. From the end of March to the middle of May the remaining inhabitants, carefully avoiding the village site, remained all well. At the end of May the village site was thoroughly cleansed by the removal of all manure to the fields, and early in June the village was re-inhabited, without, so far as I know, ill consequences.

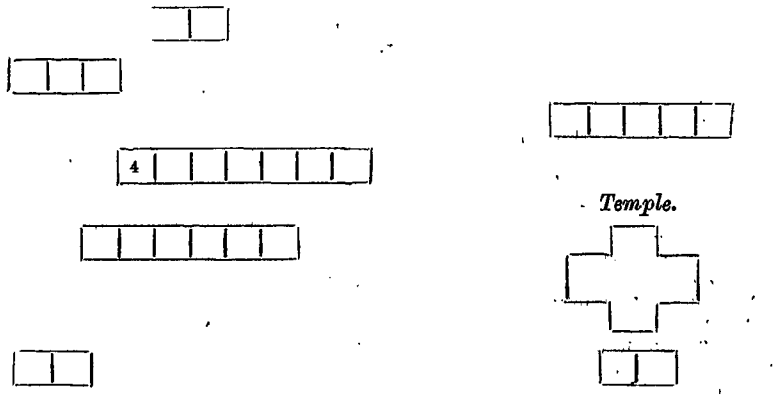
128. During all the time of the prevalence, or even suspicion, of golá disease the Sirar people lived in a state of strictest quarantine. The reality and strictness of this quarantine was forcibly illustrated during one of my visits to the village. On arrival I found the people in a great state of excitement on the hill side. On inquiry, it appeared that in the early morning—it was a time of general snow—a Jharow deer had come down into the village land from the wild inner country, had been attacked by the people, shot in the leg, wounded with axes, and almost killed as it crossed to die within a neighbouring village boundary; yet the people of Sirar had not dared to follow the animal over their boundary because of the established quarantine, and the game had been carried away by the neighbours in the sight of the Sirar men, who claimed a share of the flesh, or money recompense.

Nainoli.

129. Nainoli is a village of some importance situated near the top, but on the southern aspect, of a mountain.

and about eight miles north-west of Almora. It stands on a steeply sloping surface, and the habitations are built in terraces, of which the following is a rough ground-plan:—

Nainoli.



I inspected this village for the first time on the 1st of January.

Golá disease first appeared in this village on the 18th of January, and the following is the local account of the outbreak and course of the disease:—

130. Some time in November last a deaf young man, nephew of Rup Singh, went to Tánda, taking radishes to exchange for rice. The rice he obtained was taken out of the house in Tánda to which a case of golá disease had been brought from Kausáni as will appear hereafter.

The deaf nephew carried the rice to Nainoli, and it was stored in Rup Singh's house. On the 15th of January this rice (dhán) was husked by the women of Rup Singh's house, and it was cooked and eaten by all the members of the family. On the 18th of January Rup Singh's daughter, aged 12, who had never left the village in her lifetime, was taken ill with symptoms of continued fever, ending in delirium, insensibility, and death on the fourth day. Before she died, a small glandular enlargement was seen in her groin. On the 19th of January Rup Singh's son, a boy, was taken ill and died on the fourth day also. On the 21st of January Rup Singh's wife was taken ill, and died on the sixth day. And on the 25th of January Rup Singh's daughter, aged 16, was taken ill, and died on the fourth day. The symptoms in all four cases were alike, and bubo was seen in three out of the four cases. After the fourth death occurred, Rup Singh, his third daughter, and the deaf nephew —all the remaining members of the family—hastily vacated the house, and took up their abode in a shed on the northern aspect of the mountain, far from the village site.

131. At the time of my inspection the following were the local conditions:—A village of substantially-built houses, like those described in the report of Bált and Bintola. The lower rooms utilised for the accommodation of cattle, and consequently piled with manure accumulations of many days. This was specially noticeable of the houses forming the terrace to which the infected house belonged, and more specially of that house itself and the adjoining house, the accumulation of manure in which reached almost to the floor of the upper room at the back part. All the people of this terrace have vacated their houses, to live in the other houses of the village which are inhabited as usual.

In all other respects the village site and its precincts presented a wholesome appearance. Most of the houses of the vacated terrace seemed to be old, the wood-work of the fronts decaying, the upper rooms close and bad smelling, no labour for cleanliness having apparently been expended on the houses, either inside or out, certainly for a long time.

The three remaining members of Rup Singh's family were examined and found well. Rup Singh stated that he had buried all the persons of his family who had died, and pointed out his wife's grave immediately below the house. Stones and branches had been piled on the grave to prevent its desecration by jackals.

132. With the assistance of Rup Singh and his nephew, and some of the men of the adjoining house, Rup Singh's house was burnt, together with its contents, excepting tools, papers, and valuables. All the clothing and coverings of Rup Singh's family were burnt, and new clothes and blankets given to them.

133. No other case occurred in this village, and when I visited it again on the 15th of March the terrace was found to be re-inhabited, the people engaged in cleansing the houses and removing the manure to the fields, Rup Singh being prepared to rebuild his house so soon as he had received the promised compensation.

Gajula.

134. Gajula is a small hamlet of three houses situated on the mountain side above Bált, and about one mile distant from it. The houses stand two together and one separate, thus:—

Gajula.

I visited this hamlet on the 2nd of February. Only one death from golá disease occurred in it, of which the following is the account given by the head of the family, a retired havildar of the late Kumaun battalion:—

135. Early in December, a woman from Bált, fleeing from that village, came to Gajula, and passed one night there in an outhouse, by permission of the havildar's wife, who sat with her for a little time. In the morning the havildar, hearing of the woman's presence, obliged her to leave. Afterwards the woman died at Bált of golá disease.

On the 8th December the havildar's wife was taken ill with symptoms of continued fever; on the 12th she was delirious, and a bubo appeared in the groin. In the evening she died, and her husband buried the body, together with the clothing and blanket, in a field about 20 yards from the house. After burying the body, the havildar, taking his two children, left his house to inhabit a cave in the mountain side about half a mile distant from the house. The inhabitants of the other two houses also fled away to temporary sheds on the hill side, and at the time of my visit the houses were empty—all the people well.

The houses were clean and well kept, somewhat close hemmed by fruit trees, but wholesome looking places of residence.

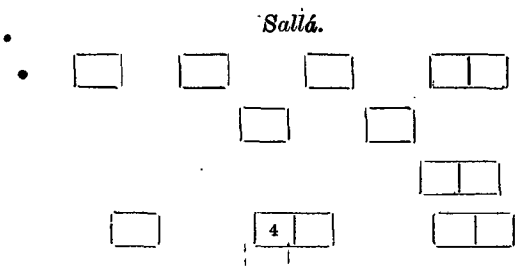
The people were looking after their growing crops, and prepared to return to their houses if so advised.

As a precautionary measure, green wood was burnt in the lower storey of the havildar's house, and the house thoroughly filled with smoke for many hours. All cotton and woollen fabrics or rags found in or about the house were burnt. In March the people returned to their homes, and have all remained well.

Sallá.

136. Sallá is a village of well-built scattered houses, picturesquely placed on a green hillock backed by high mountains. It is about four miles north of

Bintola, from which it is divided by a mountain range. Roughly drawn, the houses are thus placed, on a sloping surface with eastern aspect:—



137. The following is the local account of golá disease here:—

Early in January the wife of one Kishná went to Bintola to inquire after her daughter, who was married to a man of that village. Her daughter was well, and has remained well. On the 13th of January Kishná was taken ill and died; then Kishná's son, 18 years old, died; then Kishná's daughter, four years old, died; her death occurred on the 29th of March. In these three cases glandular enlargements were noticed before death in two. The first two died in their house; the daughter died in a hut made for her just outside the house. The bodies were buried in a field below the house.

138. I visited the village on the 2nd of February, and noted the following local conditions:—A village of well-built double-storied houses, some old. All well scattered amidst cultivation of wheat and barley which covers the hillock on which they stand, and extends from the houses down the bottom of the valley; fruit trees, principally walnut and cherry, mixing with the houses. A pleasant site of very wholesome aspect, as seen from far off. The lower stories of the houses generally noticed to be utilised as cow-houses, and consequently filthy.

This filthiness most noticeable below and around the house in which the deaths have occurred and the adjoining house. These two houses, standing alone, were noticed to be very old. The village padhán's (headman's) father had lived in it, but having recently built a new house, the existing padhán had let the old house to Kishná, and now the old place is a neglected tumble-down filthy tenement, half house, half barn, and all cow-shed below, with manure piled beneath and around.

Many of the people have vacated their houses, and all have been put to great trouble by this outbreak of disease, which they attribute to the reprehensible conduct of Kishná's wife in visiting Bintola. All are apparently of opinion that the old house should be burnt, and many bring straw and wood to throw into the doorway for that purpose.

Of Kishná's family only two persons remain—his own and his son's wife—who have been occupied during the morning in taking the grain out of the old house and hiding it in baskets under straw on the hill side.

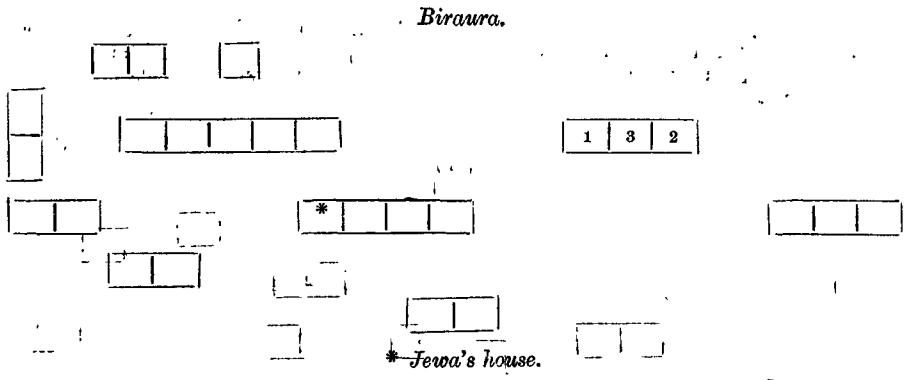
The people object to this proceeding, but, being afraid to approach the women or the house, they could not prevent it. Now they ask that the grain may be burnt, pointing out its hiding place. The two forlorn women are of opinion that if the grain is destroyed they will starve.

139. With the consent of the padhán, the old house, with its adjoining filthy tenement, were burnt down; the hut in which the daughter died was burnt; the two women's clothing and blankets were burnt and replaced. The hidden grain was divided, the wheat and rice being placed to one side, the madhua and choá (inferior grain) to the other. The former were given to the women, the latter burnt.

140. It was afterwards reported that one of the two women mentioned died of golá disease during my absence at Kausáni, making four deaths in all in this family. Measures were taken to ensure the thorough cleansing and whitewashing of all the houses, and the people returned to their village in March without harm.

Biraura.

141. Biraura is a pretty considerable village, situated about one mile south-east of Sirar, with which, although a mountain intervenes, it is in communication by an ill-marked pathway. Its site is about two-thirds down the eastern aspect of the mountain, and its well-cultivated fields extend around the village and down to the bottom of the valley in which the Sáoul river runs. The houses—well-built and doubled-storied, after the Bintola plan—are arranged for the most part in short terraces, from above to below on the quickly sloping site in the following order:—



142. The history of the outbreak of golá disease here is as follows:—

During the months of January and February a man named Tejua, 30 years old, who lived at Biraura in one of the houses of a terrace of three, went several times to Sirar to visit Ganga Ram. He was present at Sirar on the 28th of January when I visited that village and brought home news of my proceedings. On the 20th of February, when I was engaged in the interior, Tejua was taken ill with symptoms of continued fever, and died on the third day insensible, and without appearance of bubo or swelling anywhere. While he was sick, his young wife, almost a child, came from her parents' home and nursed him during the last two days of his illness, sleeping in the same room with him on the night of his death. In the morning she ran out of the house leaving the body in the house, where it remained four days.

The facts having been reported at Almora, the villagers were directed to burn the house and dead body together, which was accordingly done. Only they burnt two houses instead of one. No other case occurred prior to my visit on the 5th of March, when the following conditions were noticed and facts noted:—

143. Site wholesome everywhere, excepting beneath the houses and upon the stone platforms facing the houses, and the unwholesomeness there due only to the keeping of cattle in the lower rooms of the houses—a general practice, but with less marked results of filthiness than in other villages inspected. This comparative betterment, due to the existence of five detached cow-sheds in which some of the cattle are housed. The young wife of Tejua living alone in a grass hut of the meanest kind raised against the terrace wall of one of the fields. The inhabitants of the infected terrace have vacated their houses to live together in a cave; indeed, two of the houses found to have been burnt out, and only one remains. The other people living in their houses. No rats known to have died here. New clothes and blankets given to the young wife; her old clothes and blanket burnt.

In the house next to Tejua's, one Buchua, his wife, his father, one son, and one daughter had resided. In the third house lived a widow woman and her son.

On the 6th of March, Buchua's wife was taken ill. She had helped to nurse Tejua, and had given him water to drink while he was ill. Her symptoms were shivering, hot skin, quick pulse, pain in the head. On the third day she was delirious, a swelling appeared on her neck, and she died that night. This was the husband's account, as nothing was known of her sickness and death, until I again visited the village on the 13th of March. She was nursed by her husband in the empty house of one Jewa, died just outside the house, and was buried by her husband, who carried the body on his shoulder 30 yards or more to the grave. The burying was seen to have been well done, the grave heaped with stones. When she was taken ill all the people of the village vacated their houses to live in huts and sheds on the hill side. On the 16th of March, Tejua's young wife was taken ill; she died on the following day, alone in her hut, and her body was, it is supposed, taken away by jackals. On the 25th of March, Buchua's father died in the cave with symptoms of continued fever. On the 6th of April, the son of the widow of the third house died in the cave with like symptoms. These deaths were reported some days after they had occurred, and the facts were recorded on the 14th of April when I again visited the village.

The two last dead had been buried by Buchua, who was found in the cave nursing his infant daughter, who has been ill eight days. The child's symptoms were—pulse quick, skin hot, countenance cheerful; has a large shining boil in front of the left thigh, which commenced to form on the 5th day of the disease. On the 16th April, the child was found peevish, but otherwise well; the boil, fluctuating, was punctured and much white pus flowed out. On this day all the contents of the cave, all the clothes and blankets of the remaining people living in it, were burnt; new clothes and blankets supplied, and the Buchua party, reduced to four persons, were removed to another cave.

The child recovered, and no other case of golá disease occurred.

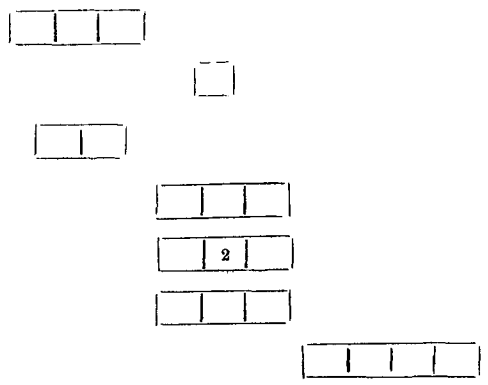
The village was carefully cleansed, the houses white-washed, and the people returned about the end of May, without, so far as I know, any return of disease.

I should add that, to the best of my recollection, the third house of the terrace was burnt, and Jewa's house fumigated with burning sulphur; but I have no note of the facts.

MAICHOR.

144. Maichor is a village situated about half-way between Almora and Binsar, and near to the road which connects these two places. It stands on a separate spur of hillock shape, and the houses have the following ground-plan:—

Maichor.



145. The history of the outbreak there is thus recorded:—On the 12th of April, a man, aged 24, who lived in the centre house of a terrace of three, was taken ill with symptoms of continued fever, became delirious, and died on the 15th of April, after passing four fœtid, involuntary motions. No bubo or swelling appeared. He was nursed in his house by the other members of the family, and buried by his grandfather and a woman.

The village was inspected on the 16th of April. The lower rooms of the houses were noticed to be utilised as cow-sheds with the usual result.

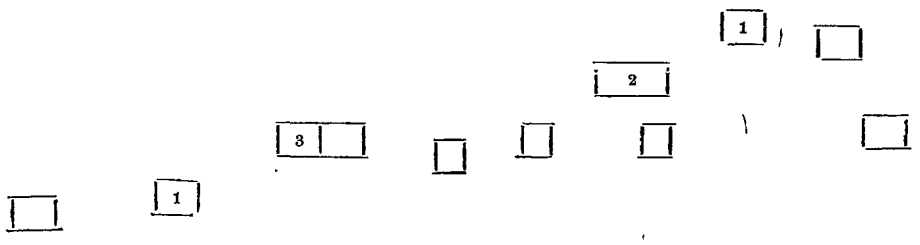
The houses of the terrace were sealed up, the people living in it directed to hut themselves separately far from the village site. The clothes of the compromised family, five persons in all, were burnt, and new clothes given to them. On or about the 24th of April, when I was at Taili-hat, a brother of the first man who died, and who lived in the same house, was taken ill and died with symptoms of continued fever. No other case occurred.

The village had been cleansed, the houses white-washed, and the people were all well when I visited it on the 1st of June.

MATOLI.

146. Matoli is a village of well scattered houses, its lands adjoining those of Maichor. The following ground-plan shows the relative position of the houses:—

Matoli.



Seven deaths in all occurred here, and the following is the history of the outbreak:—

147. On the 12th of April, on the same day as the case occurred at Maichor, the wife of one Tejua was taken ill and died on the third day. No appearance of bubo was seen on her person, and her body was burnt. The day after she was burnt, her infant of one month was taken ill and died within 48 hours; its body was buried. On the 27th of April Tejua's niece, a girl of 16, was taken ill and died on the sixth day; a large swelling was seen in her neck. The above three persons were nursed and died in one house, and the body of the niece was buried in the floor below the house upon which she lay when she died; for, seeing the swelling, her relations were afraid to touch her body for removal, but dug a trench alongside the body and pushed the body into the trench. After this girl died all the people vacated their houses to live in huts on the hill side.

In the house nearest to that of Tejua lived Jewa, his brother, and in reality the two families lived as one. On the 2nd of May a boy of 12, who lived in Jewa's house, was taken ill and died in four days.

While the boy was ill, a son and a niece of a Dom named Bijua were taken ill and died in three days. Bijua, it was stated, had assisted at the burial of Tejua's niece. Lastly, an old man named Junia died on the 14th of May.

148. During the period in question I was engaged amongst the villages of the interior, hence this imperfect account. I inspected Matoli on the 1st June and recorded the above particulars. No case of disease had occurred since the 14th of May, and the people desired to return to their houses, but were afraid to do so, on account of the dead body lying in the floor of Tejua's house.

Tejua stated that he would never inhabit the house again, or touch the grain it contained, and with his consent the house was burnt with its contents.

Shortly afterwards the people returned to their homes and have remained well. In the meanwhile measures were taken to cleanse the village and whitewash the houses. At my inspection only the Dom quarter was noticed to be particularly filthy.

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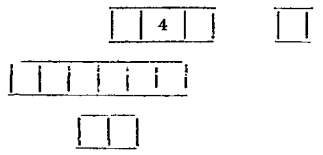
149. The group of villages affected in pargana Boraki-Rao (*see* paragraph 108 above) are scattered principally along the line of road which leads from Almora to Baijnáth, and the following particulars were recorded during a tour of inspection which employed me from the 18th to the 26th of February:—

BAUNRI.

150. A village of Chatris, situated two miles south of Sumesar, 17 houses in all, of which those in the immediate neighbourhood of the affected house present the following ground-plan:—

Baunri.



The following is the history of the outbreak of Mahámári disease here:—

On or about the 28th of November last a man named Tika Ram was brought home sick from Kausáni, where he was employed in the tea factory, being very skilful as a tea-drier. He was suffering with symptoms of continued fever, and died in his house the day after he got home. Nine days after his death two children of the same house were taken ill, their symptoms being intense fever, followed by delirium (*bakné laga*), on the second day insensibility, and death on the third. While the children were ill, Tika Ram's eldest brother, who also lived in the same house, was taken ill and died on the third day with the same course of symptoms. No diarrhœa or sickness was noticed; no bubo or swelling occurred in any case. Tika Ram's body was carried to the established burning place by his four brothers, accompanied by several people, and burnt. The other three bodies were buried by the three remaining brothers. After the eldest brother was buried, all the remaining people 15 or 16, of the affected terrace of three houses vacated their homes to live in a long shed about 40 paces distant from the terrace. All were found well there on the day of my inspection, the 18th of February. The other people remained in their houses, and all are well. No rats are known to have died here.

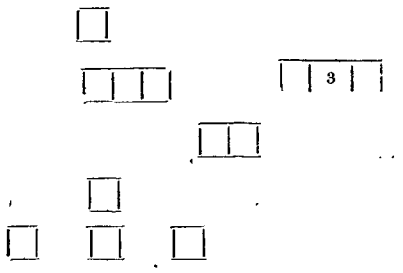
151. At my inspection the houses generally were seen to be filthy in and around the ground-floor, by reason of the housing of cattle in the lower stories. The people were seen to be employed in building separate cow-sheds. Measures were taken to ensure the careful cleansing of the habitations, so soon as the cattle could be put outside. All cotton and woollen fabrics found in Tika Ram's house were taken out and burnt, together with some coarse grain of bad quality. The house was closed up and fumigated for some hours, and the family were cautioned not to return to it for some time longer. I do not know when they returned to the house, but no death has been reported from the village since the date of my inspection.

TÁNDA.

152. At Tánda about 1½ mile south of Sumesar, only one case occurred, of which the history was thus given by the padhán of the village at the time of my inspection, the 20th February. Towards the end of November last, a young man came home on a Saturday night sick from Kausáni tea factory. He had symptoms of continued fever, but was able to walk home, about a seven-mile journey. On the Tuesday following he became insensible and died in one of the two adjoining houses thus | | 1 | in which a family of 12 persons resided. No bubo or swelling was seen on his person, and his body was burnt in the established burning place, at the river's edge. 12 men accompanied the body to the burning place, carrying the body in turns. None of these men have been sick. The 11 remaining persons of the family continued to reside in their house, and none have been sick. No rats died here.

SAJOLI.

153. Sajoli is a village of widely scattered houses standing just off the highway about a mile south of Sumesar. 12 houses in all, placed as below:—



154. The history of golá disease here was thus recorded at my visit on the 18th of February:—About six weeks ago an old man, who lived in one of two adjoining houses highest placed in the village, was taken ill, and died, in three days, insensible; during the last day he had diarrhœa. Nothing particular was thought of his illness and death, and his body was burnt as usual. 14 days after his death two young girls of the same house were taken ill; one died after four days' illness, the other after five days' illness; and in this last case a boil-like swelling arose on the girl's chest before she died.

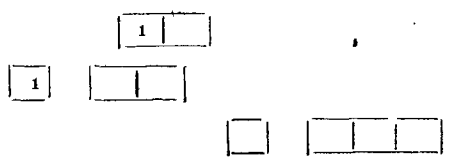
Immediately after these girls died and had been buried, the remaining members of the families inhabiting the two houses vacated their homes to live on the hill side. The other people remained at home as usual. Now all are well, and no person has been ill since the last girl died.

At my inspection I noticed that two very good separate cow-sheds existed in this village but not belonging to the people of the vacated houses. These were seen to be extremely filthy around and below, by reason of great accumulation of manure, cattle having been lodged as an established custom in the lower rooms. The owners of these two houses had taken the grain out of them, and desired that they should be burnt. But, under the circumstances, I thought it might suffice to fumigate and thoroughly cleanse the houses, and burn all cotton and woollen fabrics they contained. Measures were taken to effect this, and the families cautioned not to return to their houses for some time longer. No report of any return of the disease has reached me.

PHÁLIÁNTI.

155. A hamlet, about 3½ miles east of Sumesar on the road to Bagesar, containing nine houses placed as follows:—

Pháliánti.



The history of golá disease here was thus recorded during my visit on the 19th of February:—

156. Near the end of November last, a youth aged 16 came home from the Kausáni tea gardens ill. It had been reported at his home in Pháliánti that he was ill at Kausáni, and his father, with four other men, went to fetch him home. His father carried the sick youth on his back to the top of the Kausáni hill, and there a rough dándi was made, in which he was carried by the five men to Pháliánti. When the youth arrived at Pháliánti he was insensible, and he died soon after arrival. The body was taken to Bagesar by seven men, a distance of about nine miles, and burnt at the much frequented ghát there. No bubo or swelling was seen in this youth's case. About eight days after the first youth died, his brother, aged 17, came home from

Kausáni on foot, on a Saturday evening, ill. On Sunday morning a swelling appeared in the armpit, and in the evening he died. The body was hastily buried outside the village site, but jackals pulled it out of the shallow grave provided, dragged it into a ravine, and ate it. In this case the remaining members of the family vacated their houses immediately after the youth died, but three persons continued to live in the house to which the first youth was brought, as the sick boy was never carried into the house, but put down to die outside.

No person of the hamlet has been ill since. None of those who carried the sick youth or the body have suffered. No rats have died here.

157. At my inspection the hamlet was found remarkably clean everywhere. The houses, neatly washed with red clay, were wholesome above and below. The houses were said to be washed with the red clay every 15 days as a custom. A separate cow-shed was noticed to be utilised for its proper purpose.

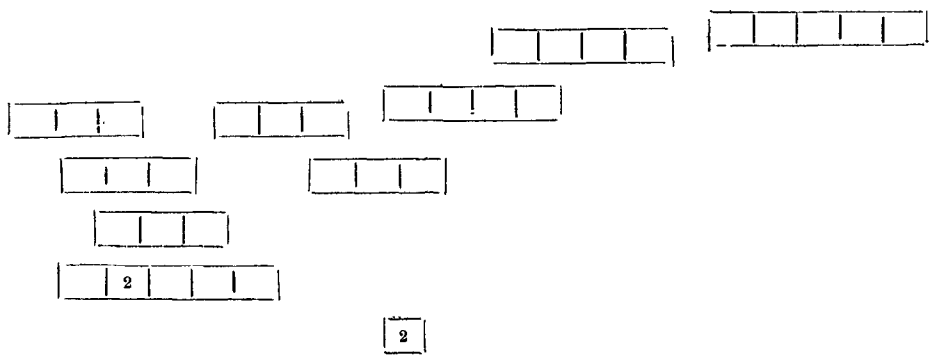
The two boys who died here inhabited the same room at Kausáni.

Cháni.

158. Cháni is an important village about two miles south of Kausáni tea gardens. It stands on a hill a little way off the highway between Sumesar and Kausáni, and its cultivated lands extend principally in the widish valley of the Kosi river, which takes its rise in the great Pingnath mountain east of Cháni, and flows beneath the village.

As a site of habitation no place could be better chosen than Cháni, on the sloping brow of a somewhat separate hill which stands out from the great mountain behind it. Its high site provides perfect drainage, the terraced slope of the hill and the spreading valley below provide fertile land carefully cultivated, and, although all is green around, very little of excessive vegetation exists anywhere. The houses are arranged on the sloping surface, in short terraces, after the following plan:—

Cháni.



159. I inspected this village on the 21st of February, and found its pretty numerous people in great trouble; their houses and village site empty and desolate; the inhabitants miserably lodged in grass huts amongst their crops in the valley.

This condition had resulted from an outbreak of golá disease, thus described:—

About the middle of January the wife of one Subhan Singh, who lived in a detached house lowest placed of any in the village, was taken ill with symptoms of continued fever, and died on the fourth day. Then her son was taken ill with like symptoms, and died in three days. This mother and son died about the same time, and as bubo was noticed in the case of the mother, their bodies were buried about half a mile outside the village site, some twelve men assisting.

The mother had been nursed by Guman Singh's wife, who lived in a house of a terrace adjoining Subhan Singh's house. On or about the 27th of January, Guman Singh's wife was taken ill and died, unattended, in the lower room of her house. At the time of her sickness she had a suckling infant girl which remained with her, and after the mother died no person of the village was found brave enough to rescue the infant. The husband, questioned on this point, said that as the infant had taken its mother's milk during her illness, he knew it must die, and so he left it with the corpse. It died two days after the mother, and then the husband drew the bodies out of the lower room, and hastily buried them in front of the house.

Excepting for this hasty visit of the husband, no person had entered the village site since the last woman was attacked, and all had remained well.

It was said that rats had died in Subhan Singh's house before his wife died, and the cause of the outbreak of disease was locally attributed to the presence of certain ghi and grain which Subhan Singh had recently imported from a village of Dánpur and stored in his house. Subhan Singh was at Bagesar engaged in conducting some lawsuit or quarrel when his wife and son died; returning home he was afraid to enter his house, and retired to Áná in Kathiúr, where he has another house.

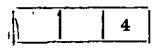
160. On inspecting the village, the lower stories of the houses were found filthy, as a rule, owing to their utilisation as cow-sheds; the upper stories without ventilation, close smelling, and unwholesome. Two dead rats were found below Subhan Singh's house, and the burial place in front of Guman Singh's house was recognisable by portions of infant remains, which had been partially eaten by birds or jackals.

The two infected houses were burnt with their contents, in accordance with the general desire, in which the padhán joined. Measures were taken for the heaping of a large mound of earth and stones over the remains buried in the village site, and for the cleansing of the houses and their whitewashing inside and out.

The people returned to their homes in March, and there has been no return of disease since.

Behtá Tallá.

161. Behtá is a village just off the high road about midway between Kausáni and Baijnáth. It is divided into Behtá Mallá (upper) and Behta Tallá (lower). Behtá Tallá consists of a terrace of three well-built houses, thus:—



and the people of the three houses live as one family, all being related and all Brahmans.

At the beginning of March, it had been reported that the chief person of this family having attended, in his character as Brahman, the funeral of the wife of Subhan Singh at Cháni, had been attacked with golá disease and had died.

Making local inquiries, at the time of the journey of which I now write, this had been strenuously denied. The eldest brother had died, it was allowed, but of malarial fever, and not of golá or any contagious disease, and so the matter rested.

During another journey of inspection in April which led me this way, I heard frequent reports of the happening of other cases in this family; and so persuaded were the people of neighbouring villages of the presence of golá disease at Behtá Tallá, that no outsider would go near the place. Under these circumstances I thought it advisable to make more careful local inquiry, when this second opportunity offered.

162. On the 23rd of April I inspected the three houses of Behtá Tallá, and examined the people living in them. In the house of the man who had died at the beginning of March, two women and a boy were found suffering from continued fever, having been ill several

days. The women would not permit a careful examination, but in the boy's left groin a prominent suppurating bubo was found. These three persons had evidently been very dangerously ill, but seemed likely to recover. The people here behaved in a violent manner, and endeavoured to prevent any close examination of the sick persons. They could not be persuaded to vacate the terrace, nor would believe that any infectious disease was present amongst them.

With considerable labour the infected house was burnt out, after all the valuables, cooking vessels, and tools had been removed. All the clothing and blankets of the compromised family were burnt and replaced, all cotton and woollen fabrics, mostly rags, in the house were burnt. There has been no report of any death from this village since, and it may be concluded that the three sick persons recovered.

Kausáni.

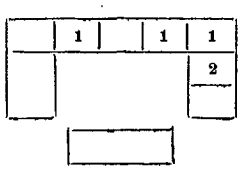
163. There is no village proper at Kausáni, so far as I could make out. The whole of the land known as Kausáni is occupied by the celebrated tea gardens of that name, which extend down the upper half of the north-eastern slope of a great mountain overlooking the Baijnáth valley in which the Gúmti river flows.

On almost all the land of this large estate the tea plant is cultivated in slopes and terraces with great care and success. The land absolutely clear and clean everywhere, except for the well-pruned tea plants, which dot its surface in well-ordered rows.

Upon the estate a large company of (between 500 and 600) gardeners are constantly employed, and these people are lodged in short ranges of huts scattered in different portions of the estate.

164. The outbreak of golá disease which occurred here was thus recorded at my visit of inspection in company with Mr. McMaster, the manager, on the 23rd of February.

The cases of disease were confined entirely to one range of eight huts, of which the following is a ground plan :—



In all, five cases of the disease occurred, namely, one of a man who died in his hut on the 28th of November, and who had a long swelling in his armpit when he died; one man who went away sick and died at Tánda; one man who went away sick and died in Baunri; and two boys occupying the same hut who went away sick and died at Pháliánti. All the cases occurred about the same time, namely, towards the end of November and beginning of December, and immediately after the disease was known to be golá, the seven or eight persons who remained unaffected vacated their huts to sleep elsewhere, and all have remained well. A fortunate circumstance as regards the prosperity of the estate, for symptoms of a great fear were noticed amongst the general body of gardeners, who would assuredly have fled away to their homes had more cases occurred.

I saw the persons who had vacated their huts and remained well. The principal of these was a chaudhri, or chief of a gang. The chaudhri stated that for days before any man was taken ill, rats, which were numerous in the range, were found dead in every hut, and he particularly remembered the fact, because, at the time, the men rejoiced over the death of the "destructive devils" when they threw them out in the morning.

Two dead rats were found in one of the huts at the time of my inspection.

165. With regard to the cause of the outbreak, the local opinion was that it was due to the fact that the father of the Pháliánti boys had brought ghi and grain for their use from Khajúli (the village next inspected).

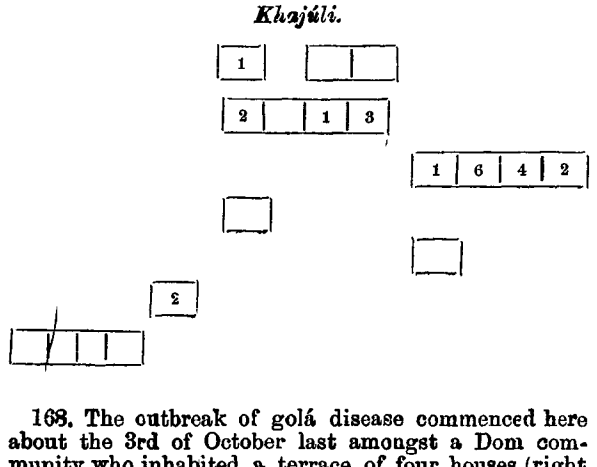
On this point Mr. McMaster stated that when the man who died at Baunri went away ill, he left a considerable store of grain and other things in baskets and boxes in his hut. Desiring to protect the man's property, Mr. McMaster had it removed to a loft above one of his drying rooms, and there locked it up. Soon after, a very unpleasant smell was noticed in the drying room, and the unpleasantness being traced to this store of property, the boxes and baskets, with their contents, were immediately taken out of the loft, piled in a heap in the open, and burnt. The cause of the bad smell was not traced to any particular article of the property; no dead rats were noticed amongst it. It all appeared to smell badly, and was all burnt without delay to prevent the spread of a general alarm concerning it.

166. Since the outbreak occurred the infected range has remained vacant. The people have cooked their food in an open shed fronting it, but no man has slept in the huts. These appeared as fairly well-built one-roomed tenements, with thatched roofs, well plastered inside with clay, and absolutely clean inside and outside, the precincts clear and clean. With the consent of Mr. McMaster, to whom my acknowledgments are due for much consideration and attention, the infected range was burned down, together with the open shed facing it. Up to the present time there have been no more cases of the disease at Kausáni.

Khajúli.

167. Khajúli is a village of poorly-built thatched houses, situated on a sloping site bordering the Gúmti river, two miles above Baijnáth. It consists of two portions, an upper and lower, divided by a shallow ravine, and the houses stand somewhat in the following order :—

Khajúli.



168. The outbreak of golá disease commenced here about the 3rd of October last amongst a Dom community who inhabited a terrace of four houses (right of plan). Of 25 persons inhabiting this terrace, 13 died—four men, two women, and seven children; all died with the same symptoms of continued fever, delirium, insensibility, and death on the third, fourth, or fifth day, and swellings arose in the armpits and groins of several before death. The last of these deaths occurred on the 2nd of November in a grass hut on the hill side, for the people of these houses vacated their homes towards the end of October. Certain of these Doms were employed to husk rice during October on the platform of a neighbouring terrace inhabited by the Chatri owners of the village. On the 19th October a member of the Chatri community was attacked with the disease, and died on the 22nd in the house nearest to the Dom terrace. A few days afterwards two other members of the same Chatri family were attacked and died, their deaths being speedily followed by the deaths of three other persons of the same terrace who had nursed their sick friends. Then the Chatri community vacated their houses. Lastly, in this upper part of the village, a deaf and dumb Brahman, who lived alone in a house above the Chatri terrace, died.

During the time the sickness prevailed in the Dom terrace certain Doms who lived in a detached house in the lower portion of the village paid frequent visits to their friends above, sat with and nursed the sick. Two persons of the lower placed family were attacked with the disease, and died towards the end of October; then the people of the lower portion vacated their houses.

169. I inspected the village on the 25th of February and found it still empty, the people living in grass huts outside the village, but desiring to return to their old houses. The village was seen to be remarkably clean as a rule, but the lower rooms of the Chatri terrace had been used as cow-sheds. The site appeared wholesome in every respect.

About the beginning of January the Chatri owners had burnt down the Dom terrace and Dom detached

house, so that nothing remained to denote their sanitary state at the time of the outbreak. It is probable that they were as carelessly kept as Doms' houses in general, but they had no lower story, and consequently cattle could not have been lodged beneath them.

No cause could be assigned for the outbreak by the principal men of the village, who also denied that any ghí or grain had been supplied to the father of the Pháliánti boys, as stated at Kausáni. The only stranger believed to have visited the village since the outbreak commenced was a Dom from Cháni, who came in October to inquire after his friends, and slept one night in the house of one, Anuá, who was ill with the prevailing disease. Dead rats were found in the houses of the Dom terrace first attacked. All those who died were buried. No case of the disease had occurred since the 2nd of November, and the Chatris would like to return to their houses, but dreaded the attempt because of the infected houses which remained.

The Chatri owners were persuaded, without difficulty, to burn their infected houses in my presence. The people returned to the village in March, and all have been well since.

Mangaltá.

170. A hamlet of two separate houses, situated on the Gúmti river about two miles higher up the stream than Khajúli. Inspected on the 25th February.

Three deaths from golá disease occurred in one house. The history of the outbreak is as follows:—

During October a woman of Mangaltá was employed in cutting the crops at Khajúli, coming home at night to sleep. This woman sat with and nursed one of the Chatri women who died of golá disease at Khajúli. Four or five days afterwards she herself and another woman of her house were attacked with the disease, and both died after three days' illness. During their illness a daughter of one of the women was attacked, and died on the fifth day, a bubo appearing in her armpit before she died. This child died outside the house in a hut on the hillside, as, after the women died, the remaining members of the family, six persons, vacated their house, the father taking his sick child to a separate hut and nursing it. When the child died, the father threw its body down a steep place, and pushed earth over it, but the jackals took the body away. The bodies of the women were disposed of in the same manner.

The people of the house are still living on the hill side, and are all well.

171. The infected house was an old thatched tenement of two rooms, the lower story a filthy cattle place. The dead body of a buffalo lay at one corner of it. It was burnt.

Ajula.

172. Ajula is a village of little importance, situated about three miles north of Baijnáth. The village with its lands forms part of the Ajula tea estate.

I inspected this village on the 26th of February in company with Mr. Norman Troup, the Manager, who was extremely obliging and attentive, aiding my investigation not only here, but also in the two villages—Khajúli and Mangaltá—previously mentioned.

The people of Ajula village are principally employed in rearing and tending cattle, the resulting manure being utilised in the tea gardens of the estate. Some of the people are also employed as gardeners or manufacturers of tea.

Deaths from golá disease having been reported from this village, it was necessary to visit it and record the local history of disease. But the results of the record render it doubtful whether golá disease was ever present amongst the population concerned.

173. At my inspection the village was seen to be remarkably well kept, the habitations clean with clay washing, both in the upper and lower rooms; the latter being utilised as store places and for the cooking of food. The cattle were noticed to be lodged in long separate cow-sheds near to the habitations.

After the season of rains it is customary for the people to drive their cattle to the forest lands and there graze them for some months; the cattle and their keepers living continuously in the forest.

The first death reported from golá disease occurred in the case of a man who, last November, accompanied by his wife and child, took his cattle to the forest as above described. On the fourth day after he reached the forest he was taken ill, and died in his hut after six days' illness. He was nursed by his wife during his illness. Both wife and child returned to the village, after three months' absence, well. The second and third deaths reported occurred in like manner in a forest hut 15 days after the forest was reached, and death occurred on the 5th or 6th day. The fourth and fifth deaths reported occurred during December in one house of the village. The remaining members of the family vacated the house during part of January, but have been living in the house for the past six weeks, and are all well.

The sixth case was the child of a Dom who died after nine days' illness.

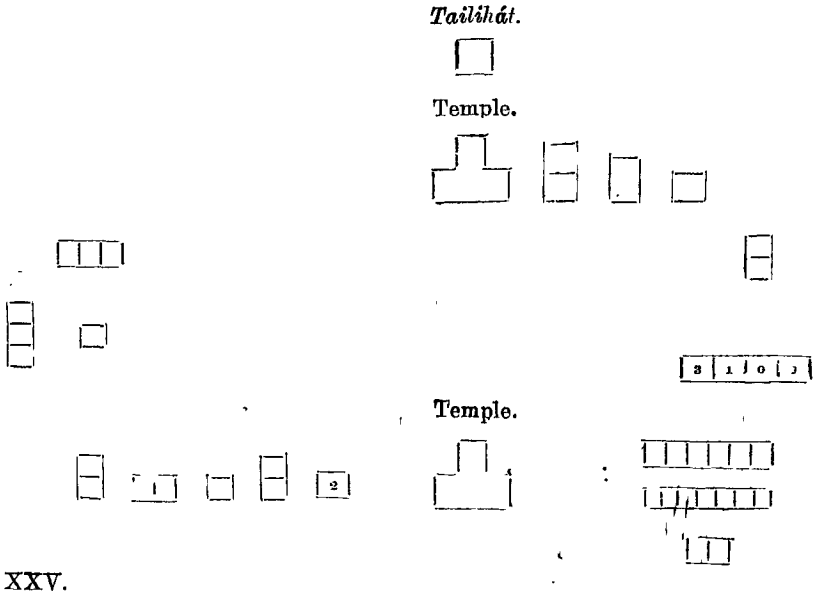
The seventh case—a syphilitic man—said to have died of dysentery.

With the exception of the last case, all these persons were said to have died of fever, but no bubo or swelling was noticed in any case. All the houses have been inhabited for the past two months or six weeks, and all the people have remained well. When the two persons died in one house, all the people vacated their houses for a period of 12 days, but having no proof of the presence of golá disease, a longer stay outside was thought unnecessary.

Tailihát.

174. Tailihát stands close to Baijnáth. Its site is nearly level, in a bend of the Gumti river, and it is an old centre of population—contains Buddhist temples of dark granite, one 600 years old—and may have been a place of some importance when Kathiúr was separately governed. Now it contains, besides the important temples, two or three good houses of Bráhmans or pujáris, and many poor thatched houses of modern construction, well scattered over the site after the following plan:—

Tailihát.



The site is close hemmed by the river on three sides; is made up in great measure of boulders mixed with earth, and is probably liable, if not to flooding, to excess of moisture in the rainy season.

175. Golá disease first appeared here early in April last. I inspected the village on the 24th of April, and the history of the outbreak is thus recorded:—About the end of March dead rats in considerable numbers were found in the houses of three terraces (right of plan), and early in April three persons at one house in these terraces were taken ill and died after four or five days' illness, swellings having arisen in their armpits or groins. So soon as the disease was known to be golá, all the inhabitants hastily vacated the village, to reside in huts on the hill side far away, excepting the people of the infected terrace, who were all friends and people of one caste. They nursed the sick and buried the dead bodies. Two days after the first three had been buried, two more persons of the same terrace were taken ill and were removed to huts outside, where they died. Other friends of the people of this terrace lived in a detached house near to it, and visited those who were first taken ill. Two persons who had resided in this house were attacked with the disease, and died in huts outside.

The last of these died on the night before my inspection. He was said to be ill, and I went to see him. On approaching the temporary hut in which he lay, about a mile from the village, a jackal ran out of it, and the man was found dead; the body was abandoned. A large swelling in the groin testified to the cause of death. Fuel of pinewood was gathered from the hill side, and the hut and body consumed.

With great difficulty the remaining members of this man's family—three women—were found. They were in great terror and distress—one just recently confined. Their clothes and blankets were taken from them and burnt; new clothes and blankets being given to them. The remaining persons of the infected terrace were re-clothed in like manner.

The people were desirous that the infected houses should be burnt, and also the houses of the two adjoining terraces, which had been inhabited by Doms, and in which rats had died. The Dom community had vacated their houses immediately after the disease declared itself in the other terrace, and had remained all well.

The infected terrace and the detached house were burnt.

No history of infection could be gathered here; no cause could be assigned for the outbreak. The houses were not particularly unwholesome. As a rule, the cattle were lodged in separate cow-sheds; some of the lower rooms had been utilised for this purpose, but the resulting manure had in great measure been recently carried to the fields which had just been ploughed for rice-sowing.

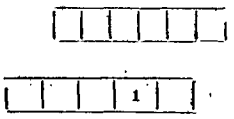
Measures were taken to provide a supply of food for the homeless people, who were cautioned not to approach the village site—a warning hardly necessary, for, with the exception of one Brahman, no person would go to it with me.

No new case has been reported from this village. The people returned to their houses in June, and all have remained well so far as I know.

KÚRÚRÁ.

176. Kúrúrá is the Dom quarter of Purála village, about one mile east of Baijnáth, on the Gumti river.

Kúrúrá consists of two terraces containing 11 houses, thus—



The houses are all inhabited by Doms, and are placed far from, and much lower than, the houses of Purála proper.

177. Only one person died of golá disease here. The following is the history of the case:—On the 9th of April a Dom was taken ill. He suffered for 13 days with symptoms of continued fever, much pain in the head, and then died. A swelling rose in his armpit on the sixth day, and remained until he died on the 22nd of April. I visited the village on the 25th of April, and found the compromised family of five persons living alone in a hut amidst the village fields, their house being empty.

All the other houses inhabited as usual; all the people well. By general consent the compromised family had been isolated and so remained. The dead body had been buried. The cause of the disease was attributed to the fact that the dead man's brother had visited the people of Khajuli early in March, but as the last death from golá disease at Khajuli occurred on the 2nd of November, it is not likely that the case was connected in any way with the brother's visit. The Doms of Kúrúrá have relations and friends at Tailihát, and the infectious cause may have come from there.

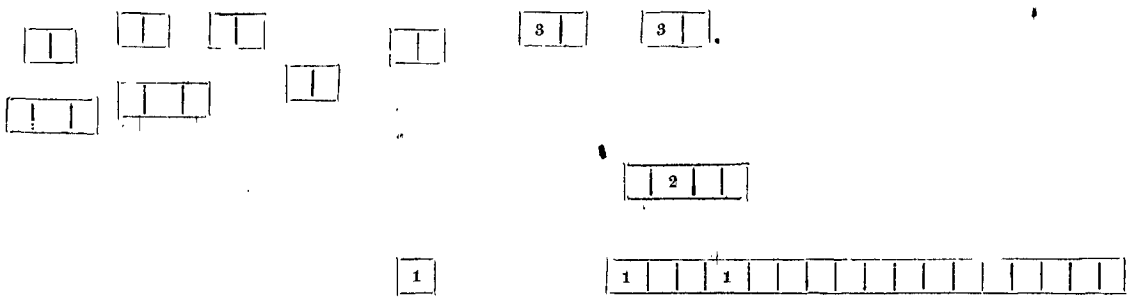
The five remaining persons of the family were re-clothed, their old clothes and blankets being burnt. The entrance ways of their house were carefully built up with stones, after the house had been fumigated, and the family were directed to live in their hut apart for at least a period of two months. The family remained well, and no other case of disease has been reported from Kúrúrá.

178. The group of which I have now to report consists of only two villages, Bhándárgáon and Dugara, in Attargoli (*see* paragraph 108)—a portion of Kumaun immediately north of the important Ranikhet cantonment. The outbreak of disease in those two villages was severe and prolonged, and cause of much anxiety, by reason of their proximity to that cantonment.

BHÁNDARGÁON.

179. Bhándargáon is an important village about seven miles north of the Ranikhet cantonment. It contains about 62 houses, scattered mostly in terraces, on the upper half of the eastern slope of a hill of moderate height which is bordered by the highway connecting Almora with Srinagar. The ground plan of the portion of the village affected by the disease may be roughly sketched thus—

Bhándargáon.



180. I inspected this village on the 14th of February, and again on the 20th of April, and the history of the outbreak of disease was thus recorded:—

There is a well remembered local history of an outbreak of golá disease in this village 16 years ago, when 42 persons are said to have died of it, and at the same time the disease prevailed in the neighbouring village of Sagúni—a fact confirmed by the padhán of Sagúni, who was a well-grown man at that time. The deaths at Bhandargáon on that occasion were said to have occurred principally in the very same houses affected now, and specially in the four upper houses inhabited by the padhán and his family.

181. The present outbreak commenced in October last with the illness of a man who lived in a detached house, lowest placed of any in the village. He died after five days illness with symptoms of continued fever, a swelling appearing in his groin the day before

he died. His body was buried in a shallow trench at the back of the house. In the next adjoining house, one of a terrace of 17, lived friends of the sick man who came to him when he was ill. The next person taken ill lived in that house, and also died in October. In November another person died in the fourth house of the terrace. In January six persons died, two in a house in the middle terrace, and four in the upper houses belonging to the padhán. Of these sick persons one was buried in the middle terrace at the back of the house in which the death occurred, and all the other bodies were hastily buried in different portions of the village away from the houses. But the burials were hastily done in shallow trenches, and jackals and the village dogs had torn the bodies up to eat them. The people knowing this, had killed all their dogs with clubs; eight skeletons of dogs lying in different places testifying to the truth of this statement. This history was recorded, during my visit of the 14th of February, with considerable difficulty; the people being reluctant to afford information, evidently disliking my visit. I think it not unlikely that more than nine deaths had occurred, but can only record the facts as stated by the people. The last death had occurred on the 25th of January, and all the people were well on the 14th of February. They had vacated their houses to live in grass huts far away from the village site. At this inspection it was noticed that considerable efforts had been recently made to improve the sanitary aspect of the village by removing manure to the neighbouring fields. Yet enough remained to show that the lower rooms of the houses had been crowded with cattle at night, as an established practice. In connection with two or three of the houses, substantial cattle-sheds were noticed, but the roofs of some of those sheds had fallen down, and not one of them seemed to have been utilised for their intended purpose. At present the cattle are living out of the village with the people.

182. The principal men here were of opinion that the disease of which the nine persons had died was sanjar and not golá, disbelieving the statement that the first case had died after the appearance of bubo.

No swelling had been seen in any subsequent case. The symptoms had been continued fever, delirium, insensibility, and death on the third or fourth day.

They desired no help from me, but requested that I would report their labours for the cleansing of the village.

They were earnestly advised not to return to their houses for a considerable period of time, or until after the village had been thoroughly cleansed and the houses whitewashed inside and out.

183. All remained well with this population until the 14th of April. Early in April, the padhán (a thokdár) and his son returned to their houses in the upper part of the village where four persons had died. On the 14th of April the thokdár's wife was taken ill, showed unmistakable appearances of golá disease, and died on the 17th. Seeing her hopeless condition, the thokdár hanged himself to a beam just above the place on the floor where his wife lay dying, and in the morning the son found both father and mother dead. News of this having reached me, I returned to the village on the 20th of April, and, with the son's permission and assistance, burnt the house, and re-clothed the four remaining persons of the family, burning all their old clothes and blankets. The son, a man of 38, had buried his father and mother. He seemed much depressed, but helped heartily to burn the infected house, after he had removed all the valuables it contained — money, papers, tools, and cooking vessels.

The people of the other infected houses had not returned to their houses, and were all well. The village was seen to have been further cleansed; all the manure carried away to the fields. This work had been done in the daytime, at intervals, but no person had stayed the night in any house of the infected portion of the village since my first visit, excepting the thokdár and his family as described. The thokdár's son inhabited the house adjoining his father's. Some days after his father and mother had died, the son, who had removed to a hut outside, was taken ill, and also died of golá disease. I do not know the date of this last occurrence as, at the time, I was engaged in the Munshári country of Upper Dánpur.

No other death has been reported from this village. During May and June the people lived outside in huts, and I cannot say when they returned to their homes, but think they must have done so when the rains commenced.

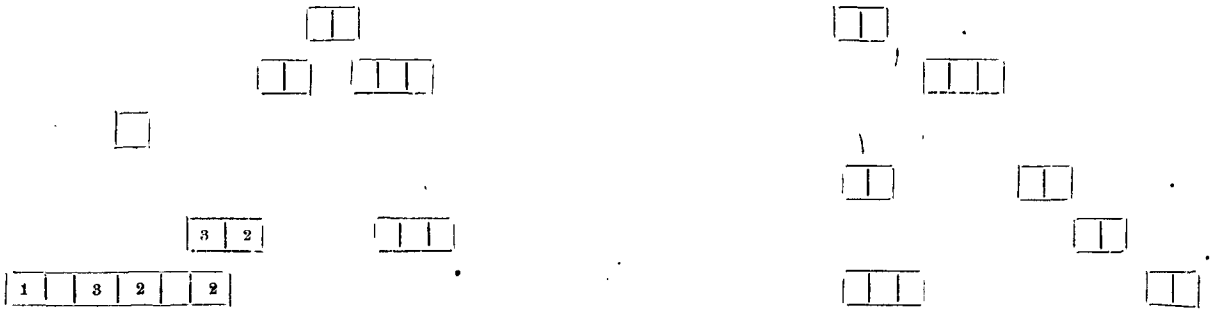
Dugora.

184. Dugora is a very large village five miles north of Ranikhet, divided into East and West Dugora by a branch of the Gágas river, which flows in a deep ravine. So that the two portions of the village stand high placed on the sloping surface of opposing mountains — a distance of fully half-a-mile dividing them.

This centre of population is much isolated, being reachable from the highway only by a dubious footpath, between three and four miles long.

185. Golá disease commenced in East Dugara, of which the following is a rough ground-plan; all the houses being well built, double-stories tenements, roofed with stone:—

East Dugora.



The first case occurred in one house of a terrace of six, on or about the 28th of November last, and during December and January 12 other persons of this terrace and of two adjoining houses were taken ill, the last on the 26th of January; all these 13 persons died. The inhabitants of the eight infected houses numbered 28 persons, all relations or friends, of whom almost half died.

The symptoms of the disease were those of continued fever, attended with delirium on the second or third day, and death generally on the third or fourth day. In some cases death did not occur until the sixth or eighth day; and in those cases glandular enlargements were seen in the armpit, or groin, or neck. The people knew of no cause for the outbreak. Dead rats had been found in the houses both before the outbreak and while it lasted.

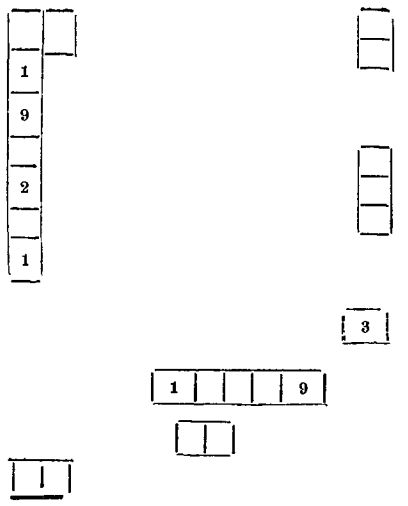
App XXV.

186. I inspected the village on the 15th of February. There had been no death since the 26th of January. The people of the infected houses had left their homes during December to live on the hill side in grass huts, and some of those who last died, died in huts—all the other people had remained in their houses. At the time of my visit the remaining people of the infected houses made a show of having returned to their houses, but were careful only to sit on the outer stone platform in a row.

Proofs of the former practice of housing cattle in the lower rooms were plentiful enough, and the custom was not denied. But a great amount of cleansing had been effected, in obedience to orders received previous to my visit, and, as a rule, all the houses of the village were seen to be fairly well kept.

187. The plan of West Dugora is as follows:—

West Dugora.



In this village the first death from golá disease occurred in the house of a barber, who had visited the sick people in East Dugora. This death occurred in one of a terrace of five houses in December, and was quickly followed by two other deaths in a house of the same terrace. When I first visited the village on the 15th of February only these three deaths had occurred, and the people of the families concerned denied that they had been due to golá disease, saying that two had been due to dysentery and one to asthma. They acknowledge that the bodies had been buried, and the houses of the terrace were vacated; both very suspicious circumstances. As neither the people of the east nor west Dugora were desirous of any interference on my part for the prevention of further disease, and specially would not consent to the destruction of any clothing or property, I was obliged to remain content with advice to them not to return to the houses in which deaths had occurred for at least a period of two months, nor until after the houses had been thoroughly cleansed and whitewashed.

188. As a continued prevalence of golá disease was reported, I visited Dugora a second time, on the 19th of April, and found that this continued prevalence had been restricted to West Dugora. In all 16 deaths had occurred in this second outbreak, of which the following is the history:—Early in March three persons of the family in which two had died, as previously stated, were taken ill and died with unmistakable symptoms of golá disease. This family inhabited the corner house of the terrace, and a detached house adjoining it. These last three deaths occurred in the detached house. The other 13 deaths had occurred amongst the people of a terrace of eight houses highest placed of any in the village, and nine of these deaths had happened in the family of one Subhán Singh, whose mother, wife, son, son's wife, daughter, and four nephews died. In this family the first taken ill was the wife. She had been absent at Hardwár at the beginning of March, and was taken ill six days after her return to her home at Dugora, on or about the 12th March. She died after five days' illness, and the other deaths followed in quick succession, the last occurring on the 14th of April. The symptoms were continued fever, pain in the head, delirium, insensibility, and death after from two to five days' illness, and in some cases swellings arose in the armpit or groin. All the people of this terrace were either related or near friends. Cattle had been lodged in the lower rooms as usual, but the resulting manure had been removed to the fields, it being the time of ploughing, and the houses, although close, bad smelling tenements, were not unusually filthy.

189. With the permission of the owners and their assistance, Subhán Singh's house and the detached house in which three deaths had occurred were burnt out. The clothing and blankets of the remaining members of Subhán Singh's family (five persons) were burnt and replaced; and the people hutted on the hillside were cautioned not to return to the village site until the commencement of the rainy season. These people were difficult to manage; golá disease being apparently unknown to them before, they persisted in remaining hutted, village fashion, several huts together, the members of infected families mixed with the rest. I expected a further outbreak of disease here. However, so far as I know, only one death, of a man who had lived in the house adjoining Subhán Singh's, has occurred since my visit of the 19th of April, and I presume that the village was re-inhabited in July.

190. I should mention that a snake came out of Subhán Singh's house, whilst it was burning, and escaped into the grass. It has been recorded that snakes as well as rats die in a house infected by golá disease. Certainly this snake was alive and very strong.

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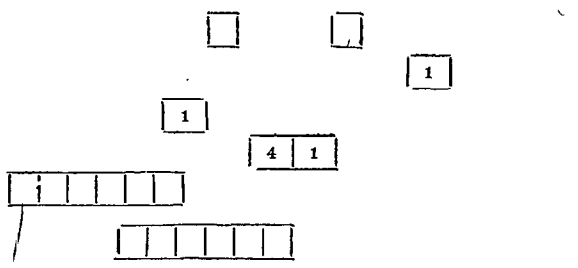
191. The group of which I now have to write consists of 17 villages, widely scattered in Lower and Upper Dánpur, a much isolated country, the boundary-land of British territory beneath the very Snows. They were inspected during the months of April and May; the facts of the following histories being recorded at the time of inspection in every case, excepting that of Gaula.

PARSÁLI.

192. Parsáli is a scattered centre of population, divided into two portions. The portion of which I have to write is called Párságli-wálá, and consists of 18 houses scattered amidst cultivated fields in a cup-like valley surrounded by high mountains, the habitations being about four miles due east of Kápkot on the Sarju river. Although low down, the houses stand, in terraces or detached, on sloping ground of hill side, something after the following plan:—



193. Seven deaths in all, five women and two men, occurred from golá disease here, and they all occurred in a group of houses near together in the upper part of the village.

The first death occurred on the 1st of April, the last on the 23rd of April. I inspected the village on the 28th of April.

The disease commenced amongst a family of six persons inhabiting two attached houses. The sick were nursed in the houses by their relatives, and, of the six, all took the disease and died, excepting one bent old man. In two adjoining detached houses other relatives of the same families, all being Brahmans, helped to nurse or attend the sick, and one person died in each of the detached houses. This community of Brahmans consisted of 12 persons, of whom five remain and are now living in huts, away from their homes, which they dare not enter. They know of no cause for the outbreak. In the two attached and in one of the detached houses dead rats were noticed at the time of the sickness.

The symptoms of those who died were alike, in that they all had continued fever, delirium, and coma preceding death, which happened after from three to five days' illness. In three cases swellings appeared in the groin. In the other four fœtid diarrhœa was a prominent symptom. All the bodies were buried outside the inhabited site, near to a temple belonging to the community. No sick person recovered.

194. The two attached houses in which the disease commenced were seen to be very old decaying thatched tenements, said to have been inhabited for three generations, and were certainly unwholesome above and below, for generations of cattle, as well as men, had been housed in them. The poor old head of the family, knowing the houses were past their usefulness, was building a fine new habitation near when this great calamity overtook the family. He wished me to burn the old houses, and also the infected detached houses, all places of little value. The old houses, and the one detached house in which rats had died, were accordingly burnt, after the owners had been requested to remove

any valuables they contained. Only the old man ventured, after much hesitation, to enter his house to save something valuable he had there, which turned out to be a few small, very old cymbals and bells, used at religious ceremonies.

The clothing and coverings of the five remaining persons were burnt, and new clothes and blankets given to them.

No other case of the disease occurred amongst the members of the compromised family, but one death in another family has been reported since my visit.

Sungarh.

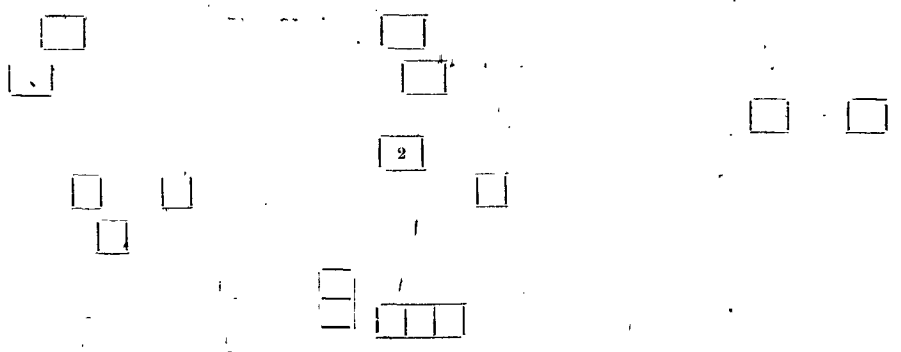
195. Sungarh is an isolated village situated on the left bank of the Sarju river, not far from its source. But a mountain intervenes between the river and the village, which is reachable only by fording the Sarju, and following a narrow pathway which winds behind the mountain. The village stands in a cup-shaped valley, girt on all sides by great mountains.

The houses are scattered amidst cultivated fields, especially of barley, which, in the Dánpur country, grows to a size, with a weight of ear, hard to match, I should think, anywhere in the world. And the appearance of this village, amidst its green slope of waving corn framed by great mountains of wildest shape, was remarkably peaceful and secluded. The mountain sides, clothed with trees and bushes, afford ample pasturage for cattle and goats, which are numerous here. But nothing of this jungle comes anywhere near the village. The houses are poorly built of stones piled in earth, the woodwork mostly unshaped branches or trunks of young trees, the roofs a thin thatch of grass. As a rule they are double-storied, but the lower story is a mere den, with a quite small entrance way, its only use the provision of a safe resting place at night for the small hill cattle of these parts or for goats. These animals are so numerous at Sungarh, however, that several separate cow or goat houses have been provided. Wherever these animals had been lodged, collections of valuable manure resulted, great around the cow-houses, small beneath and around the habitations, which were by no means so filthy from this cause, as many a house of the better built sort in lower Kumaun previously inspected.

The upper rooms in which the people live are partly habitations, partly barns, long and narrow—dingy apartments never cleansed and little swept—but the air they contain is, by reason of the thin roof, fresher than the air of a stone-roofed house.

The village may be divided into a scattered portion of detached houses of cultivators above, to which the previous description applies, and a cluster of better built attached houses of Brahmans below, after the following plan:—

Sungarh.



196. Only two deaths from golá disease occurred here, of which the following is the local history recorded on the 29th of April. In a detached house, about the midst of the village site, a boy was taken ill on the 9th of April with symptoms of continued fever. He was nursed by his elder brother, a man of 30, and died on the 12th of April. His body was buried by the brother in a field about 200 paces from the house. On the following day the elder brother was taken ill with like symptoms, and died after four days' illness, a swelling appearing in his groin before he died. His body was drawn out of the house and hastily buried just in front of it by his wife. Then the remaining people of the house, six persons, two men and a boy and two women and a girl, taking food with them, left their home and went far up the mountain side to live in huts, the men separate from the women. At the same time the people of the other houses of the village left their homes to live in huts beyond the village site, but near enough to watch their crops and protect their property. At my inspection all the houses were found silent, empty. With difficulty, and after much delay, the six persons of the infected house presented themselves for examination, and were found all well.

It appeared that golá disease was known and dreaded here, because about 20 years ago four persons of one house had died of it, and the house had been burnt by the people. Rats were said to have died in the infected house as far back as October last, and at intervals since, but no case of disease occurred until the boy was taken ill on the 9th of April. The infected house was seen to be old, the lower room had been utilised as a cow-house, but neither it nor the surrounding surface was unusually filthy. Two long cow-houses, not shown in the plan stood near to the house, and they were extremely filthy with manure in large quantity, below, before, and behind. The man's burial place was marked by a small heap of stones. No person of the village would go near the house on any consideration. The haste with which the house had been vacated was shown by the fact that cooking vessels containing food had been left on the fireplace.

197. The house was burnt. The six remaining persons of the family were taken down to the Sarju, their clothing and blankets were burnt, they were directed to wash in the stream, and new clothing and blankets given to them. The men of the party refused to associate with the women, because they had nursed the sick man, and one of them had buried him.

A great pile of wood was heaped over the buried place and burnt, much ashes and charcoal resulting.

All rags, rubbish, and old coverings, found near the house were carefully collected together and burnt.

There has been no report of any new case amongst this village population since my visit.

Báret.

198. Báret is on the highway which connects the Sarju river near Kapkot with the Rámganga river near Tejam. It is placed on the mountain side, about 200 feet above the roadway. Deaths from golá disease had been reported from this village, and I visited it on the 30th of April. All the houses were found peopled, and the principal men denied any appearance of the disease here, saying that the only death which had occurred since the commencement of the year had been that of a woman who had died in childbirth. The houses were seen to be remarkably clean, and the people seemed cheerful. Such being the local report and conditions, I continued my journey to villages far beyond Báret.

199. A few days afterwards a report reached me to the effect that on the very day of my visit a man was ill of golá disease at Báret and had died that night. The pátwari of this part of the country was despatched to inquire into the truth of this report, and finding it true, burnt the house in which the death had occurred. On my return journey from the Munshári country I inspected Báret again on the 29th of May, and recorded the following history:—

As far back as November last, two persons of the family of a man named Dharam Sing died with symptoms of continued fever. The body of one, Dharam Singh's wife, was burnt as usual; the body of the other,

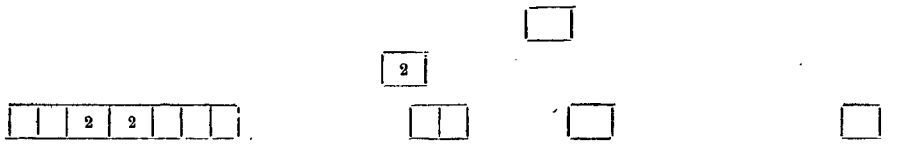
a child, was buried. Although suspicions were aroused, as no swellings appeared, the presence of golá disease was doubtful, and the people did not vacate their houses. On the 22nd of April the son of Ucha, a Dom, was taken ill, and died in a detached house at the back of the village during the night of the 30th of April. This boy had a swelling in his neck before he died, and the people, sure of the presence of golá disease, vacated their houses. Early in May a half-brother of Dharam Singh before mentioned, was taken ill and died in a cowshed outside the village, and about the middle of May a half-sister of Dharam Singh was taken ill, but was said to be recovering; on the 27th of May another son of the Dom Ucha was taken ill, and said to be now sick. All other people well.

I examined the half-sister. It appeared that she belonged to Gádera village (para. 236) to be hereafter described, being married to a man there, but had come home to her brother for a time to escape the improper attentions of another man. She had been taken ill at Báret 12 days ago with symptoms of golá disease, and was now convalescent, but very feeble. She had quite a small glandular enlargement in the groin, which seemed likely to disappear shortly, not being tender or inflamed in any way.

Ucha's child was found in an old hut amongst the fields, with the father, mother, and two other children. Its symptoms were as follows: has been ill three days, pulse 120, skin hot, tongue white, countenance fairly cheerful, has a glandular enlargement rising in the left groin.

200. The house in which Ucha's son died had been burnt by the patwári as before mentioned. The cowshed in which Dharam Singh's half-brother had died was burnt. The half-sister and an old woman who had nursed her were washed, and their clothing and blankets burnt and replaced. Ucha and his healthy children were washed and re-clothed in like manner, and separated from the wife and sick child; a bed of straw was provided in the hut, and the mother encouraged to continue her nursing of the child, for which small doses of quinine were prescribed.

201. The ground-plan of *Báret* is as follows:—



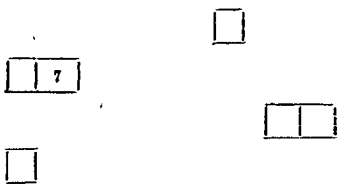
The houses were noticed to be remarkably clean, the lower rooms as well as the upper. The cattle being housed in separate sheds, of which there are at least four in different parts of the village.

202. The sick child of the Ucha family recovered after the bubo had suppurated, and no other case occurred in the family or in the village.

Naukori.

203. Naukori is a small village consisting of only five or six well-built houses situated two miles east of Báret, on the same highway, and, like Báret, it stands about 200 feet above the road on the hill side. The houses are placed after the following plan:—

Naukori.



204. I inspected this village on the 1st of May, and recorded the following history of golá disease:—Seven cases and seven deaths occurred, all in the family of Deb Singh, who inhabited one of two attached houses. The first person taken ill was Deb Singh's son, who was nursed and died in the house in November. The symptoms were those of continued fever, pain in the head, delirium, insensibility, and death. Immediately after he died the family vacated the house to live in a temporary hut constructed for the purpose far from the house. During December, Deb Singh's brother, a second son, and a third son of Deb Singh died in the hut of disease characterised by the same symptoms; all these four persons were buried, and after the third son died the remaining members of the family vacated the hut to live in a cow-house about 50 yards from the house. During the first 12 days of January a fourth son of Deb Singh, Deb Singh's wife, and Deb Singh's daughter died of the same disease in the cow-house, and of the whole family only Deb Singh and his mother remained. They fled away in separate directions, leaving at least one dead body in the cow-house unburied. This being reported, the patwári was directed to burn the house in which the body lay. The burning was effected by the old mother, who set fire to the cow-house, as directed by the patwári, standing on the road below. All these seven persons died after from two to three days' illness; no bubo was seen in any cases. The last death occurred on the 12th of January, and there has been no case of disease here since. Deb Singh and his mother were found well, and inhabiting the old house. No dead rats had been seen in the house, the upper room of which was divided from the adjoining house only by a thin partition of unjoined slabs, with many openings between the slabs. In the adjoining house seven persons lived; they fled immediately after the first child died, and are all well now.

205. Deb Singh's house was found remarkably clean, having been thoroughly cleansed before he returned to it, but before and at the time of the disease it was probably filthy below, as four cows had been lodged in the lower room for a long time. All the cattle are now lodged in separate cow-houses, and all the houses of the village appear well kept and very clean, both below and around.

The site about the houses is clear cultivated land, with grazing land of rather dense jungle beyond, and nowhere upon the land could any condition likely to be a cause of contagious fever disease be noticed. Nothing could be learnt as to the cause of the outbreak from Deb Singh. The first child who died had never left his home since he was born.

Sámá.

206. A village about three miles east of Naukori, on the same highway. Inspected on the 1st of May. Only two persons had died of golá disease here, a man's wife and his grand-daughter, said to have belonged to a party of Gwalás grazing cattle, and living outside the cultivated area in a temporary shed. These deaths occurred as far back as October last, and there had been no case since.

At my suggestion the people burnt the temporary shed in which the deaths had occurred.

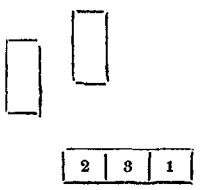
Bandhár.

207. A village of scattered houses, situated about three miles south-east of Sámá, from which it is reached only by a footpath winding over a high mountain. Bandhár with its lands occupies a high placed valley, from which the Mergari stream, a branch of the Ràamganga river, arises. A more secluded place or wilder, it would be hard to find in all the hills. Dense jungles clothe the hills there on all sides, and nature has possession of all the site, excepting in the immediate neighbourhood of the scattered homesteads which make up Bandhár, the people of which have brought into cultivation patches of excellent land bearing fine crops of wheat and barley.

208. Golá disease prevailed here in two widely separate homesteads or hamlets, an upper and a lower,

and the history of the outbreak is instructive. The prevalence commenced in the lower hamlet, which consisted of one long house of three rooms and two smaller detached houses, thus—

Lower Hamlet.



In all, six persons belonging to this hamlet died, the deaths occurring on the following dates: 18th January, 28th January, 14th February, 19th February, 26th February, 4th March. All were closely related, as follows:—A mother, her three sons, her daughter-in-law, her grandchild. The symptoms of the disease from which these persons died were—continued fever, delirium, insensibility, and death after from two to four days' illness. In some cases swellings appeared in the armpit, groin, or neck. The first two cases died in the house, then some of the members of the family left the house and took up their abode in a house they possessed in the upper hamlet, the houses of which were thus placed—

Upper Hamlet.

The first death occurred here on the 4th of February in the house to which the people from the lower hamlet had come. The second death occurred on the 2nd of March in the same house, then followed in succession seven deaths on the following dates: 3rd March, 4th March, 4th March, 4th March, 8th March, 10th March, 20th March. Of these nine persons, six were related to the people of the lower hamlet, and three who died in a detached house comprised the family of a Brahman, who, when the other people of the hamlet fled to the hill side early in March, elected to remain in his house to nurse his wife, who had taken the disease. First the wife died, then her child, and lastly the Brahman. This brave man buried his wife and child, and a few days afterwards was taken ill himself and died alone in his house. There his body remained until the 15th April, when, the fact being reported at headquarters, the patwari burnt the house and body together. The people were earnest in their praise of this Brahman's conduct, describing how he faithfully nursed his wife and child, and then determined to remain in charge of the hamlet, shouting every day to the people on the hill side that he was all right, until one morning he shouted that he was ill, passed into his house, and never re-appeared.

Those who died in the upper hamlet suffered with the same symptoms as those who died in the lower, and bubo was a prominent symptom of the disease in both hamlets. All the people who were taken ill died, and there had been no death since the 20th of March, all the survivors of both hamlets having lived in huts on the hill side since the beginning of March.

209. I inspected the village on the 2nd of May. The houses were seen to be the counterpart of those described in para. 194—old houses of three generations, and the lower rooms utilized as cattle sheds with the usual result. Much of excessive vegetation neighboured these homesteads. The site generally, especially by reason of the unusual rainfall of April in this year, presenting an appearance of conditions very likely to engender malarial fever disease in the inhabitants, but of nothing likely to be a cause of contagious fever.

Any local cause for the latter form of disease could be found only in and immediately around the habitations. In the course of my inquiries it was mentioned here that throughout the Dánpur country it is an established custom to moisten the heads of the madhua grain with water while treading them out, and to store the resulting moist grain in considerable quantities in baskets around the family sleeping apartment. The houses of the infected hamlets were uninhabited, and within the walls of the house which had been burnt the partially consumed remains of a man remained a cause of unpleasantness. These remains were consumed to ashes by means of the remaining charred wood of the house piled over them and burnt.

The infected houses, both of the upper and lower hamlet, were burnt with the permission and assistance of the owners. Six persons, remaining of the families in which the deaths had occurred, were re-clothed and their old clothes and coverings burnt. Nothing was known here of the death of rats before or during the outbreak of disease. No cause for it could be assigned by the residents; all they seemed to know of this time of terror was that the disease had come, and the survivors had fled their homes, abandoning their property and cherished crops, heavy with grain then, but now sadly injured by the feasting of monkeys and apes, a numerous race in the surrounding woods to which the people fled.

No case of disease has been reported from this village since the date of my visit.

Gaula.

210. Gaula is a village situated high up the Rámganga valley, near to the principal source of that river. The following history of golá disease there was received from the local patwári.

211. The prevalence commenced in August last, when three children belonging to one house died, and by orders of the patwári the people vacated their homes. During August, September, and part of October seven other persons died, and all the ten persons who died were related and had lived in daily intercourse. The people of the village burnt the infected house, and no case of disease had occurred since October. In April all the survivors had returned to their houses, and in May all were well.

Bhamangaon.

212. A village on the Jankula stream, one of the sources of the Rámganga. Inspected on the 4th of May. Only two persons had suffered from golá disease here, and both died. They were cowherds employed at the beginning of January in tending cattle on the grazing lands of the forest, far away from the village site, northwards. They lived in a hut in the forest, and early in January one man was attacked with disease, and attended by his companion, until death ensued on the 4th day of the disease. A day or two afterwards the companion was taken ill, and was brought, or returned, to the village and placed in a temporary hut below the village site, which is high-placed on the mountain side. He died in this hut on the fifth day of his disease and before he died a boil-like swelling appeared in his back over the spine. The body was buried and the hut burnt. There has been no case since. Five remaining persons of the same family were seen, all well, living in their house as usual.

All the houses here have been recently cleansed and clay-washed with great care. Cattle, formerly housed in the lower rooms, are now housed in newly built cowsheds of permanent appearance.

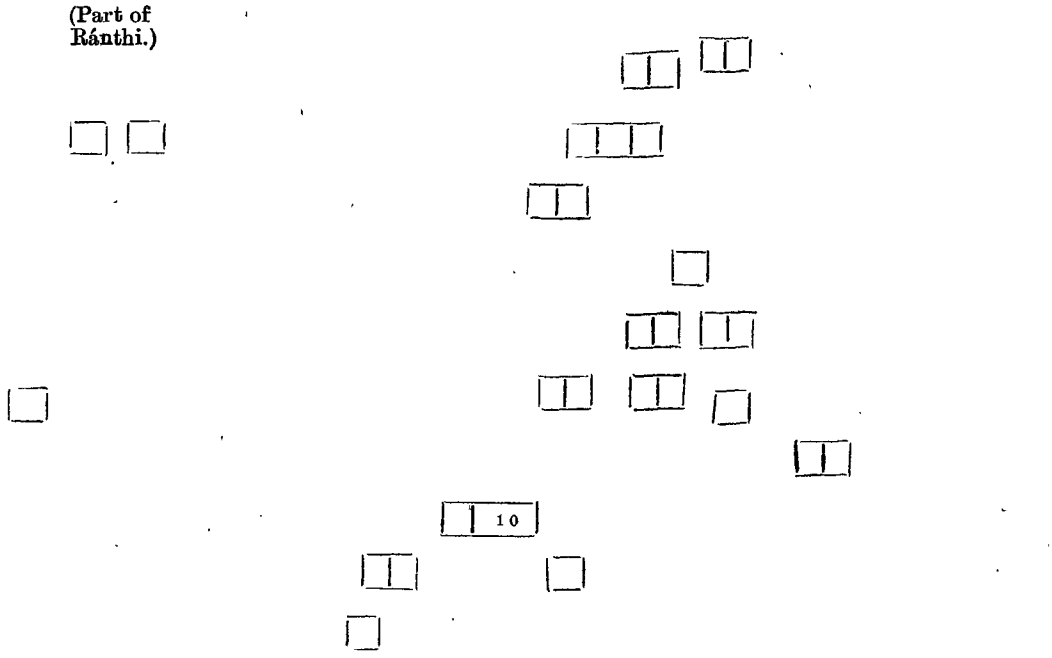
Dor.

213. A large village, higher placed in the Jankula valley than Bhamangaon, and neighboured to the south-west by another large village, Ráuthi, which stands much higher on the mountain side than Dor.

It had been reported at headquarters that golá disease had recently prevailed in both Dor and Ránthi.

I inspected these villages on the 4th of May. Dor is a village of many houses, spread over or down a rather rounded spur of the mountain thus, roughly:—

Dor.



214. The history of golá prevalence was locally recorded as follows:—

The village of Dor may be divided into an upper portion of cultivators and more respectable people, and a lower portion quite separate of Doms, or low caste people, living in five or six houses placed wide apart. About the middle of March one of the residents of the highest placed house of this Dom community was taken ill, was nursed, and died in the house after three or four days' illness. Of the 10 persons who inhabited the house all were taken ill, and died, during the period included between the middle of March and the 26th of April, and now only two of the family, who were absent from home on service, remain.

No persons now living can say they saw buboes or swellings on those who died, but those who last died had stated that swellings appeared in the groins and armpits of those who first died, and consequently all the people fled from the village.

Of those who died, two fled from the infected house to a detached house standing on Ránthi land, but far away from Ránthi village, and died in that house; and three fled to two sheds in a Ránthi field, still further from the village, and died in the sheds.

There had been no case of disease since the 26th of April, when the last man died in the Ránthi sheds. All the inhabitants of Dor were on the hill side in huts, and all well. The inhabitants of Ránthi were at home as usual.

215. The infected house was found to be an old, roughly built, thatched, double tenement, placed on a solitary ledge. The site generally filthy from manure, and overgrown with excessive vegetation. The lower rooms had been long used as cattle or goat pens, the upper had apparently never been cleansed or washed since the house was built, and were infested with hungry fleas in such extraordinary numbers that a few minutes' stay on the premises necessitated an immediate resort to a neighbouring stream, there to await the arrival of a change of clothing.

The two native officials who assisted at this inspection were attacked in like manner, and a few minutes after the house had been hastily fired all three persons were immersed in the pool below it.

The remains of those who had last died in the Ránthi sheds were found, two partially buried in the floor, and one lying on the floor in a decomposed state. Wood was heaped over those remains, and they were thoroughly consumed, together with the sheds. All clothing, coverings, rags, and rubbish found on the site were cast into the fire. The bodies of the two persons who had died in the detached Ránthi house had either been buried or carried away by wild animals. No one could say what had become of them, but they were not in the house, which had been abandoned by its owner, and was burnt out.

216. The people of Dor remained on the hill side until June, all well. It is presumed that they returned to their homes before the rains commenced. No death from golá disease has been reported from Dor or Ránthi since the date of my visit.

Chachaina.

217. Chachaina is a hamlet of Dor, consisting of five houses, about a mile from it northwards. The houses are placed as below:—

Chachaina.

218. The history of golá disease here is thus recorded:—On the 24th of April a boy was taken ill with symptoms of continued fever, and died on the 26th of April. He was nursed principally by his aunt and mother. The aunt died on the 30th of April, and the mother was believed to be ill or dead on the day of my inspection, the 6th of May. But she had left the house while ill, and nobody knew where she had gone to. With considerable difficulty her hiding place was found, being a shallow cave in the mountain side far below the house. There she had died, probably on the evening of the 5th May, alone, and her body had been drawn a little way out of the cave by wild animals who had torn the arm and leg. A prominent swelling in the groin testified to the cause of death. Straw and wood were heaped over the body in great quantity and it was thoroughly consumed. All clothing and coverings in the cave were burnt, and the cave itself burnt out with much straw and grass. The infected house, said to be three generations old, was burnt down.

Three persons of the family remained—a girl and two men. They were found with difficulty, but would on no account approach the dead body, or help to burn it. One of the men stated that he was the son of the dead woman, and had been employed as cowherd to the Dom family at Dor, which had nearly died out of golá disease, and that he had brought grain (received as wages) from the Dom house to his own house.

The three survivors were taken down to the stream, washed, and re-clothed; their old clothing and blankets being burnt. They then took up their abode in a cave or hut far distant from that in which the mother had

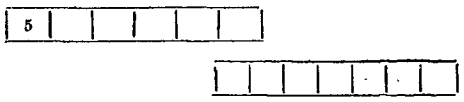
died. On the 7th of May the girl was taken ill and died on the 11th. On the 16th of May the younger of the two men were taken ill, suffered from golá disease, and recovered. I saw him on the 27th of May on my return journey from Munshári.

He stated that his little sister had attended the mother who died in the cave, the men fearing to do it. That his cousin, the other man, ran away when the girl was attacked with disease, and he remained to nurse his sister, who died after four days' illness. He buried the body, and remained alone in a hut under a great rock for five days, when he was taken ill with shivering, followed by fever, which quickly produced insensibility. He recovered his senses, and was able to eat and drink on the 20th of May, when a swelling rose in his groin. He now, the 27th of May, presents an appearance of extreme debility; is emaciated, and has a suppurating bubo in the groin, and two suppurating boils on the buttocks. But he is on the road to recovery. The hut in which his sister died, and he lay ill, was burnt; his clothes and blanket were burnt and replaced, and a new hut provided for him. He perfectly recovered, and no other case has occurred at Chachaina. Nothing is known of the subsequent history of the cousin who ran away.

Birtang.

219. Birtang is a hamlet of about 13 houses, situated near the head of the Jankula valley, close to one of the sources of that river, a picturesque waterfall. Birtang stands near the foot of the waterfall. I inspected it on the 7th of May.

The houses form two terraces, thus:—



220. Five deaths in the family of Inayat Singh occurred here from golá disease, of which the following is the history:—The first case, that of a boy of 11, ended fatally on the 11th of December last; next a brother, aged 15, died; then a third brother, aged seven. These all died in the house. An uncle left the house to work at the new Tejam bridge (distant eight miles) after the first boy died; the uncle was taken ill and died at the Tejam works. And, lastly, a fourth brother, aged two, died on the 29th of December in a hut. I should mention here that soon after the uncle died at Tejam bridge, two other workmen there were taken ill and died. All the remaining workpeople then fled, and the construction of the bridge was arrested for a time. No disease occurred amongst the people who fled, and they were at work, all well, in April. Of the four sons of Inayat Singh who died, one had a boil on the ear, one a bubo in the armpit, and two had vomiting and diarrhœa. All had symptoms of continued fever, delirium, and insensibility preceding death, which occurred after three or four days' illness. Only the father and mother of the family remain, disconsolate, but well. They nursed their children tenderly, but have had, so far as they know, no symptom of the disease.

They returned to their house from a hut in the jungle in April, and since their return Inayat Singh has been employed in dismantling his house, intending to use the wood to build a small new house, the two old people not requiring a large house now all their children are dead. The hut in which the last child died has been burnt. With the exception of the Inayat Singh family, no people left their homes here, and all have remained well.

221. The houses were noticed to be particularly filthy, and specially the lower room of the partially dismantled house; though all were pretty much alike in respect to filthiness, the result of housing cattle in the lower rooms. No other probable cause for the appearance of contagious fever disease could be noticed. The people, and especially the children, were filthy in their persons, but the weather had been remarkably cold and damp for some time past, and that may not be a permanent condition. At any rate, when asked to do it, they washed themselves in the stream, and came out much improved in appearance. Measures were taken to ensure the thorough cleansing of the village, and the floor of Inayat Singh's house was opened out to admit sun and air to the lower rooms.

Dárkot.

222. Dárkot is a village of 116 fine stone-built houses with slate roofs, situated in the upper part of the Gori valley, and close to the river of that name. It is the winter place of residence of many families of Bhuteas, who in the summer months go up to Milam, where they also have houses to reside in, the heads of families and men crossing the Uttá Dhurá pass to trade with the people of Hundés. These Bhuteas are a strong, self-reliant, independent people, their broad-faced children bright looking, with red-brown cheeks.

Here, in November last, three persons of one family, Doms, residing in two adjoining thatched sheds outside the village proper, died of golá disease. First a man died about the 10th of November; then, after eight days, his mother died; both in one shed. Then the remaining members of the family fled away from their home, and one woman, the mother's daughter-in-law, died in the jungle far from Dárkot at a place called Ayar Pani, about half-way between Dárkot and Birtang. She died 12 days after the mother, on or about the 30th of November. The first man's body was burnt as usual, as no appearance of golá was seen on his body. Swellings appeared on the mother's body, and it was buried. Nothing is known about the daughter-in-law, or what became of her body. It is probable that she was abandoned while sick, and her body eaten by wild animals.

223. The six remaining persons of the family were seen, all well. They had returned to the village, but would not live in their former sheds, or even approach them. These sheds were seen to be old, filthy, altogether disreputable tenements. With the consent of the owner and the headman of the village the sheds were burnt.

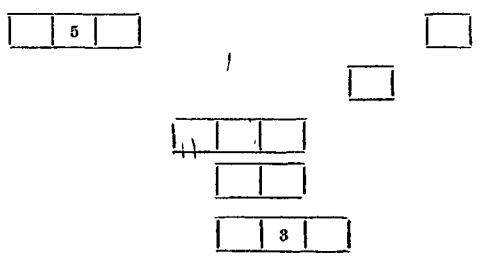
The well-built houses of Dárkot proper were seen to be well kept in all respects. In some places wild hemp was growing amidst the houses, but the people were clearing it away. And altogether, my recollection of Dárkot is that of a cheerful place; its population a healthy-looking, well-dressed people, who turned out in great numbers to witness the burning of the infected sheds.

Álam.

224. Álam is a village of about 12 houses, high-placed on the precipitous mountain side above the Gori river. To reach it from the Gori valley side, the river, a boiling flood of snow water, has to be crossed by means of a cradle sliding on a rope, the apparatus being temporarily provided for the use of the visitor.

The houses are placed on the mountain side, from above to below, in the following order and position:—

Álam.



225. I inspected Álam on the 12th of May. In all, eight deaths in two families occurred here from golá disease, the following being the history of the outbreak:—

The disease commenced in the padhán's family with the illness of the padhán's brother, who came home ill with fever from a shooting excursion on the 4th of March, and died on the 7th, a swelling appearing in his groin before he died. In this family the wife of another brother and her child died during the period between the 7th and 23rd of March, and in both cases bubo appeared as a symptom.

While the man who first died lay sick, he was visited several times by a man who had recently come from Askot to settle with his family in three attached houses highest placed of any in the village. This Askot man was taken ill on the 11th, and died on the 16th of March, a swelling appearing in his armpit before he died. He died in his house attended by his wife, who buried his body just outside the house door. Three days after he died his wife was taken ill, and died after four days' illness, and her body was left in the house

unburied. The five remaining members of the family —four boys and one girl—fleeing to a neighbouring hut, where they lived together for a few days, the eldest, a boy of 14, acting as head of the family, and providing food for the rest. The boy, feeling himself ill, returned into the house alone and died, his body also remaining in the house. Four children remained, the eldest, a girl of nine, named Dánúli, and her three brothers, aged respectively seven, five, and 1½ years. Dánúli worked for and fed them all for a few days, and during this period the boy of seven, wishing to take honey from a hive in the house, entered it with burning straw or wood to drive the bees away. Either from carelessness, or as the result of fright from seeing the dead bodies, he set the house on fire, and all three tenements were burnt down. A few days after the house was burned down the boy of seven was taken ill and died in the hut, and his death was followed by that of the boy of 1½, after an interval of some days. So that Dánúli and one brother only were left.

226. Before reaching the village on the 12th of May I had been informed that possibly children might be found there abandoned. The village was found empty and desolate, and Dánúli and her brother were found near their place of temporary abode outside the village, the former, a bright-eyed little girl dressed in an old petticoat, the latter a little urchin wrapped in a piece of old blanket, both fat and well. These children had lost their parents by the 20th of March, and from that date had been thrown on their own resources, excepting for a few days while the elder brother lived, for no person of the village would approach them.

The girl Dánúli recounted, in disjointed sentences, her experiences of the past eight weeks. Explained how her father, mother, and big brother had died; how all the people ran away out of sight; how the house had been burnt; how her brother of seven had died, and his body been carried away by jackals in the night time; how she had buried her little brother of 1½, taking the body in a basket and digging a trench for it with a pick; and, lastly, how she had been left only with the remaining brother, husking and cooking rice for both every day, leading her brother down to a stream to drink, and sleeping with her arms about him every night. Even now that so long a period had elapsed since the last person had died, no native person present would approach these children, who sat, hand-in-hand, apart as the girl told her pathetic tale of suffering and endurance. Being praised for her conduct, she cried quietly—was not comforted by a promise of sweetmeats, but would be thankful if her remaining store of paddy in a basket in the hut was not taken away or destroyed.

The few native persons present were earnest in their praises of this child, saying she had certainly saved her brother's life. To me she seemed to be about the most wonderful little person, fair or dark, that I have ever seen, or am ever likely to see.

227. All of the clothing, rags, rubbish, and human remains found in and about the burnt houses were carefully collected and consumed. The hut in which the children had died, and the padhán's house in which the first deaths occurred, were burnt with his consent. A great pile of fuel was heaped over the Askot man's grave and consumed to charcoal, which was spread over the burial place.

The two children were taken down the mountain side to a stream in which they were washed, their clothing was burnt, and they were re-clothed and provided with blankets. Afterwards they were passed in the cradle across the Gori, and given in charge of their grandfather, who was much moved at sight of the children, and promised to care for them in his village on the mountain opposite Alam.

Two widows of the first man who died were re-clothed, and their clothing and blankets burnt, as they had nursed those who died of the padhán's family.

There has been no new case of disease, amongst the people of this village, since my inspection.

Bothi.

228. Bothi is a hamlet of a few scattered houses widely separate, situated in the upper part of a wide valley which slopes towards the Gori river opposite Jalath.

I inspected this village on the 14th of May. It is much isolated, and although only about two miles in direct distance from Jalath, can be reached from it only by a circuitous march of ten miles, by reason of the intervening Gori river.

229. Golá disease commenced here with the illness of a son of one Tejua, who lived with his family in a lonely house built on a separate ledge. This son, aged 12 years, suffered from fever, and died on the 20th of February after five days' illness, a bubo appearing in his groin before he died. While he was ill his sister, aged four years, was attacked with the same disease, and died after four days' illness. These two children died in the house, and after their death the remaining members of the family, father, mother, and daughter, aged 15 years, fled the house to take up their abode in a hut, about a mile south of the house, near the pathway leading to Madkot. In the hut, the daughter, mother, and father all died in the order indicated, the last dying on the 20th of March. His body remained in the hut for a little while, but was eventually pushed into a hole with a pole by a Buthia man who is alive and well.

230. The infected house was seen to be a poorly built place of piled stone, unshaped wood, and grass roof; said to have been built 20 years. Excessive vegetation, especially of hemp, encircled the house, which, with its ledge, was shaded everywhere by cherry, apricot, and plantain trees. Before the time of this last great trouble of death, it had been, I daresay, a pleasant homestead in the opinion of the residents, but the filthiness of the lower rooms, where the cattle had lived, ruined the sanitary aspect of the place. The upper rooms were dirty from the neglect of years. The sole occupant was a little dog, very near to death from starvation and a wounded leg. It had belonged to the people of the house, and when they died the people of other houses would give it neither food nor asylum, but drove it away with violence.

The dog was removed in a basket and eventually recovered. The house was burnt down.

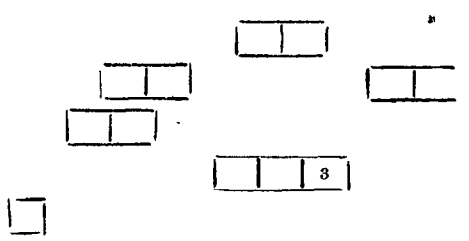
231. The hut in which the last three members of the family died was burnt. Their bodies were seen to have been hastily interred by pushing them into a pit-like depression, which had been the lower room of a long-abandoned house; some earth and stones had been heaped on the bodies. The pit was filled with fuel, which was burnt to charcoal, and so left. All the clothes, coverings, tools, wooden vessels, and other belongings of the deceased persons, nothing of which had been touched since their death, were thrown into the burning pit and consumed. Yet there was one exception to this dread of touching anything belonging to the deceased family, for it appeared that the Bhutia man, who had pushed the last dead body into the pit, at the same time buried together all the brass and copper cooking vessels of the family for purification in the earth and subsequent use. They were left undisturbed.

There has been no other case of the disease at Bothi.

Basantkot.

232. Basantkot is situated in the same sloping valley as Bothi, but considerably lower down. It is a village containing several houses, placed pretty near tog ther after the following plan :—

Basantkot.



The houses resemble those of Bothi as regards construction, being poorly built, the lower rooms utilized as cow-houses, and consequently filthy.

233. I inspected this village on the 14th of May, and recorded the following history of golá prevalence there:—

The disease prevailed only in a Brahman family residing in one house of a terrace of three tenements. The head of the family, Sibua by name, attended at the house of Tejua at Bothi to perform the funeral rites of the boy who first died there on the 20th of February, and on returning home he is said to have brought ghi

with him from Tejua's house. Sibua's wife ate some of the ghi, and rubbed some on her daughter's hair. On the 28th of February, the daughter was taken ill, and died on the 2nd of March, and the mother was soon after attacked and died on the 7th of March; they both suffered from symptoms of continued fever, but no swellings appeared. Both died in the house, and were buried in a field below the house, and then all the people of the village vacated their houses to live in huts in the jungle. The mother's sister-in-law, a girl of 15, waited on her during her illness, and soon after the removal this girl was taken ill in their hut, became insensible on the third day, and was believed to be dying. She was placed in a separate hut, and Sebua gave her water. On the fourth day a glandular enlargement appeared in her armpit, and she recovered her senses and took food. On the eighth day she was able to walk, and completely recovered. The glandular enlargement disappeared without breaking.

234. There has been no case since, and the people have returned to their homes, excepting the Sibua family, who have made arrangements for burning their house, by removing the wood-work of the adjoining tenement.

The Sibua house was seen to be a remarkably filthy tenement, said to be two generations old. It was burnt. Six persons of the family remained—the girl who had been ill amongst them, debilitated, but otherwise well. Their clothing and blankets were burnt, and new clothes and blankets given to them. These persons had all eaten grain taken from their house, for at least 30 days after they vacated it, but none had been ill. There has been no case of golá disease at Basantkot since my inspection.

Kasiabara.

235. Kasiabara is a hamlet of four or five houses in Munshári, a little to the east of and below Jalath.

I inspected this hamlet on the 15th of May. It appeared that a girl of 14 had died after three days' illness at the beginning of March in one of the houses. No bubo appeared in her case. Fourteen days after her death, her brother, aged eight years, died after five days' illness. No bubo appeared, but the people became frightened and vacated their houses for huts on the hillside, when the boy had died. Both bodies were buried, and there had been no case of disease since. The house in which the deaths had occurred was seen to be well built and very clean, having been lately carefully cleansed and washed with clay water inside and out.

All the residents had returned to their houses in good health and spirits, the general opinion being that the deaths had not happened from golá disease. Cattle had formerly been kept in the lower rooms of the house, but were in future to be lodged in separate houses. The house was well fumigated with wood smoke, as a further precautionary measure.

There has been no case of golá disease here since the date of my inspection.

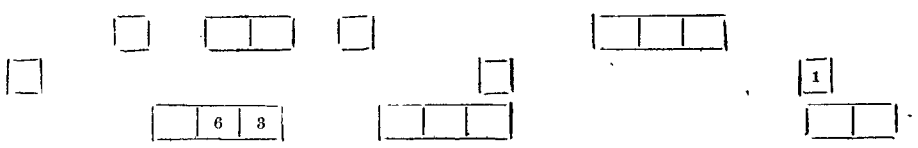
Gadérá.

236. Gadérá is a remarkably secluded village reached by a dubious pathway, winding up a wooded glen which starts from the Sarju river nearly opposite Kapkot. At its upper portion the glen opens out into culturable land which forms the Gadérá site.

The village stands well up on the mountain side, which, with gradual slope, forms a basin-like termination to the glen. To one side of the village a considerable amount of moisture oozes from the mountain side, which there has been shaped into valuable terrace rice-fields. The remainder of the site is cultivated with wheat and barley in season, is dotted here and there with trees, and presents nothing of unwholesome appearance.

The houses stand, from above to below on the hillside, after the following plan:—

Gadérá.



237. I inspected the village on the 30th of May, on my return journey from the Gori valley.

In all, 10 persons have died here of golá disease, and the following is the history of the outbreak:—On the 12th of May, Gujhia, the village Padhan's brother, a man of 25, was taken ill with symptoms of fever, and died after three days' illness. No swelling appeared in this case, and the body was burnt at the Sarju river. On the 15th of May Gujhia's daughter, two years old, was taken ill, and died in three days, a swelling appearing in her neck. Her body was buried, and all the residents fled from the village to live in huts on the hill side. Between the 19th and 29th of May the Padhan's wife, a child of the Padhan's nephew, and the wife of the above-mentioned Gujhia died. The last died on the 29th of May, and her body had been left unburied on the hillside. It was found in the shade of a large rock, water and food placed near to it, and was burnt with wood where it lay.

Two infected houses were burnt, one being a very old, ruinous, filthy tenement; the other the Padhan's house, one of three attached houses. The residents desired that all three of these houses should be burnt, as they had all been inhabited by the Padhan's family, but it was thought sufficient to burn only the houses in which those who had died habitually resided. At the time of my inspection the Padhan was noticed to be looking ill. A dose of quinine was administered to him. The clothing and blankets of the Padhan's family, 10 persons in all remaining, were burnt, and new clothing and covering supplied. One old woman of the family had nursed Gujhia's wife on the hill side until she died, and for that reason was carefully avoided by all the rest. Of these 10 persons, five died during the first 15 days of June in the following order:—

The Padhan; the old woman; the Padhan's daughter; the Padhan's son, a child; and the Padhan's eldest son's wife. The remaining five escaped the disease, and were all well at the end of August. The disease was confined entirely to the Padhan's family as described. All suffered with the same symptoms, and glandular enlargements appeared in some of those who died.

No reason for the outbreak could be assigned by the residents. The man Gujhia had not been outside the village boundaries for many days before he was attacked. That they were, however, in communication with Báret, an infected village, is sufficiently shown by the facts disclosed in the Báret history, (paragraph 199.)

Summary.

238. The preceding histories of prevalence in the 40 villages affected provide, I think, an evidence sufficient to place beyond doubt the nature and character of the disease under consideration. Certainly it will suffice to determine the question as to whether it is typhus fever or plague.

239. The definition of typhus fever in Dr. Aitken's "Science and Practice of Medicine," is as follows:—

"A continued fever, followed and accompanied by a rubeoloid eruption on the skin, generally appearing from the fifth to the eighth day. Languor, prominent from the commencement, gradually passes into complete prostration and sometimes coma. The disease may terminate favourably from the 13th to the 17th day. If the disease proves fatal, it is generally between the 12th and 20th day."

The definition of plague is:—

"A malignant fever, which has prevailed at different "times and places epidemically attended with an "eruption of a complex nature, composed of buboes "or swelling of the lymphatic glands, carbuncles, "pustules, spots, and petechiæ of various colours and "distributed in different parts of the body." And in

the history which succeeds the definition it is stated that "the symptoms noticed in plague have been "shivering and fever, followed, on the first, second, or "third day, by swellings of the parotid, axillary, or "inguinal glands. Further, that sometimes, the "poison of plague produces such disordered functions "of the great nervous centres as to destroy the patient "within two days. And in the most destructive forms "of the plague the vital principle seems to be enfeebled "to a degree capable only for a short time of resisting "the violence of the disease; but the form of plague, "beyond all others most destructive, is that which "exists without its characteristic eruption of external "marks considered pestilential. These cases perish "sometimes within 24 hours."

The general course of the disease is thus described—"attack preceded by a feeling of uneasiness and "anxiety, followed by shivering, headache, and "vomiting, then appear the characteristic buboes, "carbuncles, and petechiæ, preceded or followed by "delirium or coma, too often terminating in death."

240. The symptoms and character of the disease under consideration, coincide very exactly with the description thus provided of plague—with the exception that the appearance of petechiæ (purple spots) on the skin has not been noticed in the Kumaun form of the disease. No appearance of that nature could be seen on the skin of the sick persons examined, and no evidence of such appearance in any case could be obtained. Possibly this absence of visible petechiæ may be due to the fact, that the people affected were all dark-skinned.

But this absence of one comparatively unimportant symptom can have little weight as against the overwhelming evidence of the histories, favouring the opinion that the disease is plague, perhaps modified, in some respects, from the plague of Egypt and the Levant, by reason of difference of climate and race, but essentially the same disease, and distinguishable only under that name.

241. When first brought into contact with the disease I was inclined to think, as Dr. Renny had done, that it was a form of rapidly fatal typhus, more especially as the characteristic buboes of plague had not, as described to me, been observed in the cases first brought under my notice at Bálṭ and Bintola. A further acquaintance with the disease, its symptoms, and peculiarities, soon convinced me that it was identical with the disease *Pestis* of medical writers, and nameable in English only as *plague*.

242. The symptoms of this Kumaun *plague*, and the course of the disease, as learnt at this investigation, are as follows:—The attack is preceded by an unmistakeable appearance of lassitude and anxiety; this condition was marked in the mother mentioned in paragraph 121, and in the Padhan mentioned in paragraph 237. Usually the first symptom of actual disease is shivering, followed by intense fever. The symptoms of fever, rapid pulse and hot skin, continuing —after about 12 hours pain in the head will have become a prominent symptom. The head will be hot, the brain evidently congested. The pain continuing, by the evening of the second day the sufferer will be delirious. The delirium may be passive, the patient complaining of imaginary noises which disturb him; for example, he may frequently complain of some person chopping wood or grinding corn near the house, when all is silent there; or it may be active, the patient starting up and running out of the house, as in the case of the mother mentioned in paragraph 218, who was said to have run away in her delirium. By the evening of the third day the patient will be insensible, and will die during that night.

This is the course of the disease in by far the greatest number of cases, and in these frequent cases of death on the third day no characteristic appearance of plague disease will be found on the body after death.

243. But there are two well-marked exceptions to this general course of the disease.

First, the case in which the vital principle is overpowered at once by the violence of the disease, and in which the patient will die within 24 hours of first attack, as in the case of the man described in paragraph 116, and of the mother in paragraph 121.

Second, the case in which, after the delirium or insensibility has continued for some hours, glandular enlargements appear either in the groin, armpit, or neck. These may appear as early as the fourth day, as in the case of the girl mentioned in paragraph 122. and the case of the brother in paragraph 218, and this is the usual course; or they may not be prominently apparent until as late as the 17th day, as mentioned in paragraph 125. In this last mentioned case I have reason to think that the bubo in the groin had commenced to form before the 17th day although its presence was denied until that day. And the balance of evidence is greatly in favour of the opinion that the appearance of these glandular enlargements marks a favourable crisis in the disease. Besides these critical glandular swellings, other boil or carbuncle-like swellings, not glandular, may appear, as in the case of the old woman mentioned in paragraph 122, the case of Khemuli in paragraph 124, the case of the companion in paragraph 212, the case of the brother in paragraph 218, and with the appearance of these glandular and other critical swellings a faint hope of recovery may be entertained. The ultimate favourable result appearing to depend greatly upon the favourable progress of the swellings towards suppuration, and the discharge of matter from them. For many cases end unfavourably on the fourth, fifth, and sixth days after the swellings have commenced to appear, but of 14 cases of recovery which came under my notice, in 10 the recovery was not perfected until after the critical swellings had suppurated and discharged their contents. This certainly advantageous result of suppuration not being, however, absolutely essential to recovery, as shown in the case of the half-sister mentioned in paragraph 199, and the case of the girl mentioned in paragraph 233.

244. The dangerous character of the disease and its extreme fatality are forcibly shown by the results recorded in the histories of the 40 villages affected in this latest period of prevalence during 1876–77. In these 40 villages the total number of cases which occurred was 291, and of these 291 persons, 14 recovered and 277 died. That is to say, that of every 100 cases, 95 terminated in death—an untoward result, sufficient of itself to stamp the disease as something more urgent than that known as typhus fever.

245. The history of this *plague* of Garhwál and Kumaun, as yet recorded, shows it to be the result of endemic influence, arising from conditions or agencies peculiar to a locality. The specific poison of the disease has doubtless been constantly extant somewhere in the world for many generations past, and very probably extant for many generations past in Garhwál and Kumaun. The previously recorded account of its supposed commencement at Kidarnath in 1823 can be of value only as an expression of opinion, recounting the belief of the existing generation, amongst a people who have no records or knowledge of previous generations. The fact that the people everywhere in Kumaun and Garhwál have a specific name for the disease, calling it "*Gola*" or "*Phutkia*," both words meaning *Bubo*, not only adds strength to the belief that the disease must be plague, but favours the probability that the disease was known to previous generations. The term "*mahámari*" (pestilence) was not understood by the the country people as applied to this disease especially, cholera also being called mahámari.

246. Nothing as yet recorded tends to show that the disease has ever been epidemic, that is, tending to spread rapidly, so as to destroy great numbers of the people. During the prevalence of 1834–35, a total of 633 deaths were recorded as having happened in villages widely separated in Garhwál, the greatest number of deaths in one village having been 47. During the prevalence of 1849–50, a total of 113 deaths were recorded in nine villages.

During the prevalence in 1851–52, I find by a statement in Dr. Pearson's journal that 567 deaths were recorded in 77 villages.

During the prevalence in 1860 about 1,000 persons are said to have died of the disease, but there is nothing on record showing the number of villages affected.

During the prevalence of 1876–77, which forms the subject of this report, 41 villages in all were affected in Kumaun. Of these, I have recorded the history of local prevalence in 40, the remaining village being Nágar, on the borders of Garhwál, near Ganái, where Dr. Watson made local inquiry, and has informed me that about 10 deaths had occurred amongst the Dom community of the village. In the 40 villages of certain record 277 deaths occurred. These villages are widely separated in different parts of Kumaun, so widely, that they may be fairly considered as scattered throughout its northern half. The district contains a total of 6,346 villages, inhabited by people, with but few exceptions,

identical in race, habits, and peculiarities of life. Yet the disease has, on no occasion of its prevalence, so far as I can learn, shown a tendency to prevail in any great number of villages with contiguous lands, and certainly in this last time of prevalence nothing of that epidemic tendency existed.

This absence of epidemic tendency would appear to exclude any supposition that the prevalence of the disease may be due to any cause affecting things enjoyed in common by the people, such as the air they breathe, or the food they eat, or from any peculiarity in their common habits. And the inquiry becomes narrowed to a consideration of the local condition or peculiarities of the centres of population in which the disease is seen to prevail.

247. As touching this endemic peculiarity of the disease, shown by the scattered geographical position of the villages affected—many villages unaffected intervening—a study of the histories, previously recorded, will add strength to that opinion. For it will be seen that, as a rule, the prevalence, even in the village itself, is confined to one house, or one terrace, or one portion of the village.

This peculiarity is plainly shown in the rough ground-plans which accompany the histories. Isolated cases may occur amongst families inhabiting other portions of the village, but the commencing and excessive mortality appears almost invariably to be restricted in locality, as described—and where not so restricted, a means, other than that first operating, may be clearly traced to account for the peculiarity.

248. This means is the communication of the disease from person to person, against which the strongest and best health is no guarantee, although probably debility of the body conduces to an attack by this means. I use the term "means" in preference to "cause," because the cause, whether in the first or last case of the local prevalence, is the same, namely, the specific germ or active principle of plague which can alone produce plague disease. The disease being plague, it is hardly necessary to dwell upon the fact that it is communicable from the sick to the healthy; for, of all diseases, plague possesses that peculiarity in most marked degree. This opinion rests on the record of many facts, principal of which are the death from plague of 80 medical officers of the French, and of half the medical officers of the English army during the campaign in Egypt; and the death, with hardly an exception, of some few persons who have inoculated themselves with plague matter.

249. The histories of this record provide ample evidence of the communicability of the Kumaun plague. Best amongst much, perhaps, the evidence provided in the Baunri history, paragraph 150, the Alam history, paragraph 225, and the statement concerning Tejam bridge workpeople, paragraph 220. But the histories everywhere provide an account of a disease, not suddenly arising many cases together, but occurring, as a rule, in orderly succession of cases amongst those who lived habitually together, nursed the sick, and buried the dead. Indeed, I think the histories support the opinion that, ordinarily, the first case occurring in a village gives origin to all that succeed in that neighbourhood.

The history of the outbreak in the Balt and Bintola group of villages is as follows:—First, in Balt a young child is taken with the disease, it spreads in the family, and amongst those who nurse the sick only. A woman of Bintola attends as a nurse; she is the first taken ill in Bintola, and the disease spreads in her family and terrace only. A boy from Sirar stays one night in an infected house at Balt; the disease commences in his family, and he is the second to die at Sirar. A man from Biraura visits an infected house in Bintola; he is the first to die in Biraura, and the disease spreads only in his terrace amongst those who nurse him. A woman of Gajula lodges for one night an infected woman of Balt, who died shortly afterwards. Only the two women of Gajula died in that village. A woman of Sulla visits Bintola to inquire as to her daughter's welfare in this time of trouble; the disease breaks out only in this woman's family.

250. The peculiarity—of the commencement of a local prevalence with the death of a woman or child—is sufficiently often recorded in the histories, to make it seem likely that that is the ordinary rule, in cases where the disease breaks out without clear history of communication of the disease from the sick to the healthy. On the other hand, it seems likely, whenever the first person to die is a strong man, that then the disease has been introduced from without, as the Biraura, Baunri, and Alam histories show.

If this view is correct—and I think the histories uphold it—the inference is plain that there is something in the lives of the people which brings women and children more readily than men into such state of health as befits the reproduction of this old disease in active form.

251. The evidence in support of the belief that the germs or active principle of plague are likely to be widespread over Garhwál and Kumaun is unfortunately only too clear. Since 1823 the death of 3,600 persons from this disease have been officially recorded. Without doubt the deaths have been far more numerous, and the bodies of all those who have died have, with few exceptions, been buried within or near to the site of the affected village. The custom of the country with regard to the disposal of the dead is to burn the body beside the most convenient mountain stream terminating in the Ganges. But from this good practice the people have deviated in regard to bodies dead of any pestilence —small-pox, cholera, plague—which are buried. Of all countries, the Himalaya is least suited to burial of the dead. For, by reason of the rocky subsoil, it is seldom possible to dig a grave more than two feet deep, and, as a rule, the pestilent dead are laid in shallow trenches in the surface soil of the field nearest to the place of death, or of the terrace facing the house, or even of the floor of the house itself. This bad practice is begotten of fear, no doubt, but has been long established as a custom handed down from previous generations, and cannot easily be changed.

Fear of taking the pestilence strengthens the desire to dispose of the body with the least possible amount of handling, and it is pushed into the trench and covered up. But sometimes, with regard to plague, fear masters all other feelings, and the body is abandoned unburied, to be eventually drawn in portions about the village site by animals and birds. Such management of the dead is sufficient to account for the continuous existence of the active principle of plague disease, sometimes dormant from want of opportunity, but ever ready to affect persons suitably prepared by any cause producing a low or bad state of health.

252. The only apparent cause likely to produce such state of health in any member of a family affected in the outbreaks described in the histories is the unwholesome condition of the houses, by reason of their being utilised for three purposes, namely, as habitations, as granaries, and as cowsheds, the result being a vitiated state of atmosphere in and around the habitations, certainly conducive to ill-health amongst the residents, and more especially amongst the women and children of the house, who would be more continuously influenced. The utilisation of the house for three purposes, while it should, on strict sanitary principles, be reserved for one, would be likely, even with the best possible management, to be a cause of disease. For it has, I believe, been conclusively shown that the habitation of cavalry soldiers above their well-kept stables has been conducive to contagious fever amongst the men.

But with the bad management of the ignorant or careless Kumaun peasant the result must be detrimental. His autumn grain—partly unripe in unfavourable seasons, and always damp, as described in paragraph 209—is stored about the sleeping apartment, in open porous vessels or baskets, to slowly ripen and dry, a process often attended with some amount of fermentation, resulting in the production of gases which vitiate the air of the close room. The lower portion of his house and its immediate precincts, for many months of the year, are much encumbered with manure. The exhalations from the cattle rise into the sleeping apartment, their fluid excretions sink into the ground below the house.

253. These unwholesome conditions within and around the habitations would assuredly conduce to outbreaks of contagious fever amongst the residents in any country. That in Garhwál and Kumaun they conduce to outbreaks of plague disease is due to the fact that the germs or active principle of that disease are in wide-spread existence throughout that country. These same insanitary conditions do, in some instances, conduce to the prevalence of a form of contagious fever called sanjar by the people. This sanjar may be something less formidable and fatal than plague, certainly it is less feared than plague, but it is often fatal after a very few days' illness, the deaths mostly occurring amongst the members of one family

in a village. And from the character and genera result, as described to me, of this sanjar disease, I think it also may be plague, ending in death, before the characteristic swellings appear.

Taking the sanjar and plague together, it would appear that contagious disease ending in speedy death is a pretty common form of disease, at all times present, somewhere or other, amongst the villagers of Garhwál and Kumaun. And I do not see how this can be prevented so long as the homes of the people are mismanaged as described. For a time there may be a lull in the prevalence of these fatal contagious diseases, but so long as the conditions conducive to a general bad state of health remain unchanged, there will be danger of fresh outbreak commencing, probably in some very old and much neglected tenement. This tendency to commencement of the disease in a house of great age is shown in some of the histories, notably at Suila, paragraph 138; at Parsali, paragraph 194; at Bandhár, paragraph 209; at Chachaina, paragraph 218; at Dárkot, paragraph 223; at Basantkot, paragraph 234; at Gadera, paragraph 237; at Dor, paragraph 215.

254. Excepting inasmuch as any bad quality of the grain commonly consumed by the people may conduce to a low state of health, I do not think the prevalence of plague disease can be due to any peculiar condition of this or any other article of food. At the same time, I should say that Dr. Watson, a careful observer, is of opinion that the prevalence of plague in Garhwál and Kumaun may be due to the generation of a fungus in decaying grain. Dr. Watson's statements and arguments may be found in a paper headed "General Remarks on Máhámari," which closes this report.

It is undoubtedly true that rats are sometimes found dead in the houses of families about to suffer from an outbreak of plague. I have seen several of those dead rats in and about infected houses. They are not the strong black Norway rat which lives in the sewers of Europe, but a more delicate-looking gray species. All I have seen appeared to have died suddenly, as by suffocation, their bodies being in good condition, a piece of rag sometimes clenched in the teeth, and I think it likely that they may have died from the same cause, of vitiated atmosphere, as produces the bad state of health conducive to attack of plague in man. The best record of this death of rats will be found in para. 118 of the Bintola history, and it may be noticed that the dead rats were described as being found in the morning on the floor near to the sleeping people. It seems probable that their ordinary places of exit may have been closed. If dying of poisonous grain I should think they would be likely to die in their holes or hiding places. I have seen some live snakes near to infected villages, and one particularly live snake which came out of an infected house, as mentioned in para. 190; but I have never seen any dead snake in connexion with an infected house or village. If snakes die from eating the diseased rats, cats could hardly be expected to escape. Yet, far from seeing any dead cats, I have on several occasions had some trouble in saving the life of a cat, desperately attached to an infected house about to be burnt.

I have on several occasions recorded the fact that the people of an infected house, when vacating it for a jungle residence, took with them a supply of the grain they had been eating for many previous days, lived on it in the jungle, and suffered no harm. Indeed, that is the usual course of proceeding and frequent result.

255. Having stated so much, I should add that the histories contain evidence in support of the opinion that the consumption of extremely unwholesome food may conduce to an attack of plague, and particularly the evidence recorded at Kausani, to be found in para. 165, and I suppose it does this in Kumaun, because of the presence of the active principle of plague there; as it would, in England, conduce to an attack of contagious fever—the active principle of plague having, as the result of sanitary improvement, no home there now.

256. Plague disease, I think, prevails in Kumaun, because certain persons are, by reason of the insanitary conditions of their lives, brought occasionally into such a bad state of health as befits them for attack of the hurtful specific influence of the disease in question, thus renewing its active prevalence. And I think the only reliable method of prevention is an improved sanitary management of the houses and homesteads throughout the country. An improvement in this direction was partially effected, with apparently good results, during the years 1854–57. In the mutiny time of disturbance and anxiety, attention was of necessity diverted from this matter of comparatively secondary importance. The villagers lapsed into their old habits of neglectful management, and in 1860 a very serious outbreak of plague occurred with the usual result of excessive mortality. Again attention was directed to the necessity of sanitary improvement, which was effected with a great amount of reality, under the direction of a notoriously energetic medical officer, whose office of advice and guidance was strengthened by a magistrate's power to punish. The result was again most favourable. But again, as the histories of this report show, the villagers gradually returned to their former neglectful habits. The separate cowsheds which had been provided in many villages were neglected, allowed to fall into ruins, and eventually the cattle returned to their old homes beneath the sleeping apartments. And in 1876–77 plague renews its active existence in scattered centres of population; not perhaps with all the virulence of former outbreaks, but with well-marked fatality, causing a great amount of suffering and anxiety throughout the hill country.

257. Such being the recorded experience of past years, and attention being now directed, for the third time, to the necessity of preventing these alarming outbreaks of disease, I think a serious endeavour should be made to confer a character of permanence upon the measures of sanitary improvement which will assuredly be again revived; at least as regards the essential element of success in this matter, which is, that the cattle shall not share the habitation or its immediate precincts. An undivided attention to this one point resulting in permanent change of custom would do more to recover the habitations to a good sanitary state than many repeated endeavours to ensure cleanliness or to improve ventilation. And if the lower story of the habitation, thus permanently vacated, could be utilized as a granary, to the abolition of the custom of storing grain upon the habited floor, the second probable great cause of ill-health would be sufficiently remedied.

258. This essential measure of permanently dividing the cattle from the men is worthy of attention from another point of view besides that of prevention of plague disease. The extraordinary closeness of the lower apartments now utilized as cattle pens at night—a closeness unrelieved by any ventilation whatever when the solid door is barred—has an undoubtedly hurtful effect on the cattle.

This hurtful effect is apparent enough to any casual observer who may see the cattle as they issue from these pens in the morning. They are distressed in appearance as though unrefreshed by the night's rest, and, wherever they have been crowded together, their bodies are moist with perspiration and steam in the morning air. Cattle diseases of a contagious nature are often prevalent in this hill country, and in great measure their prevalence may be due to this form of bad management.

259. In the preceding histories I have been careful to mention the death of rats, wherever such occurrence could be testified to by the residents, or by remaining members of the compromised family. Whenever, in any history, no mention is made of this occurrence, it is because the residents have denied the occurrence, or because, by the death of all the family of the infected house, there remained no person to testify to the fact.

The villages in which the death of rats in the infected house was testified to were Bintola, Chani, Kausani, Khajuli, Tailihat, East Dugora, Parsali, Sungarh, and Naukori, and in all these places the history points to an outbreak of plague disease not resulting from infection. They seem to be places in which the disease renewed its active appearance. And, as the result of careful inquiry and observation, I think it may be true that the death of rats, preceding an outbreak of the disease, points to certain local conditions or peculiarities as giving rise to the outbreak.

In no village, where the history clearly points to infection as the cause of the outbreak, could I obtain evidence of the death of rats. And, I think, it may be true, that where rats have not died, infection has given rise to the outbreak.

260. Concerning the management of the people when outbreak of the disease has occurred, I think the proper course of procedure is to isolate the compromised family with all care, but not to cause all the people of the village to vacate their homes.

I think the family or residents of a house in which a case of golá disease has occurred should vacate their

house as soon as possible after the disease has declared itself, the sick person being carried out with the family which should be lodged in temporary sheds far from the village site.

Measures for the prevention of the spread of the disease, if centred on this family, may be effectually carried out with the minimum of loss and distress to the residents of the village. This loss and distress being very great to all concerned when the residents vacate the village site *en masse*.

When the residents vacate the village, they flee, not from any dread of their own houses or of the village site, but from dread of the infected family, their house and belongings. And if this family could be effectually isolated without delay, and their houses properly dealt with, I believe the remaining population might stay with safety in their homes.

261. The evidence of the histories greatly favours the opinion that the specific poison of the disease is most potent for mischief in the house in which a case of the disease has occurred. This fact is shown most forcibly in the Balt history, para. 111; in the Sirar history, paras. 122, 124, 125, and 126; in the Bhandargaon history, para. 183; in the Dor history, para. 214.

On the other hand, the danger of infection appears to be greatly lessened, if at all existent, in the open air. The evidence on this point is most convincing in the Tánda history, para. 152; in the Phalianti history, para. 156; in the Chani history, para. 159.

262. The indications therefore are to remove the people of the infected house into the open air, and to take effectual measures to prevent their return to the house for any purpose. Experience has taught me that the only effectual means of preventing their return is to destroy the house, by burning it out. This extreme measure of disinfection does not, as a rule, injure the stone walls of the house, which may be readily rebuilt, and it does most effectually disinfect and cleanse the premises. And especially so, in regard to the very old houses, often infected, which could not be cleansed, without danger to life, in any other way.

This burning out is the efficient plan of disinfection which commends itself to the native mind, and it alone will restore confidence to the minds of the terror-stricken inhabitants. The people themselves have recourse to it at times, as may be seen by reference to paras. 169, 196, 211, and 234. They almost invariably burn the huts in which deaths from this disease have occurred on the hill side, and would, I believe, invariably burn an infected house, but for their fear to approach it, and their natural disinclination to injure the actual owners or heirs.

263. The proper management of the isolated family is a matter of very great importance. They must on no account be allowed to visit their house. I have good reason to believe, and the histories in several places uphold the opinion, that the continuance of the disease amongst the isolated family has been due to the fact that some one or more of its members has visited the house to fasten up the cattle there, to obtain supplies of extra clothing or supplies of food. And I think it may be true that this is the ordinary reason for the continuance of the disease amongst a compromised family living in huts on the hill side.

The family must therefore be supplied with food, brought from some place other than their own house. The clothing and blankets brought with them from the house should be burnt, and new clothing and blankets given to them. They should be encouraged to hut themselves and their cattle comfortably; be directed to remain apart from all other persons of the village, while still employing themselves in tending their cattle and watching their fields. The local civil authority should attend to their welfare and protection; and in the case of death from golá disease occurring amongst the family, should take care that the body is properly disposed of; if possible, it should be burnt. If it must be buried, the burial should be effected as thoroughly as the soil will permit, in a place not likely to be ploughed up or dug into. So soon as disease threatens, the family, with the exception of the person sickening and one other, should be encouraged to hut themselves at a new place. And after the sick person has died or recovered, the attendant should be re-clothed and the old huts burnt down.

264. In concluding this report it is necessary to add that I was accompanied during almost all the time of my inspection of infected villages by a Civil Officer of the Kumaun Commission; in the first instance by Mr. D. D. McIvor Campbell, C.S., and afterwards by Mr. Hallet Batten.

To these two officers my warmest acknowledgments are due for hearty assistance and cheerful companionship during a time of hardship, only appreciable by those who have had to work for months together, on foot, amongst hill villages; a time of labour and exposure, which certainly resulted in temporary loss of health to Mr. Campbell, and which, with its accompaniment of frequent rain and hail, is not likely to be soon forgotten by Mr. Batten.

And I should state that both these officers evinced a bravery in investigating closely the conditions within and around infected houses, a sympathy with the suffering people, and a willingness to encounter scenes of desolation and death, which I have dwelt on little in the histories, but which were very real. I think the display of such qualities, amongst the terror-stricken village population, had much good effect, and well merits the favourable consideration of Government.

C. PLANCK,
Sanitary Commissioner,
N.-W. Provinces and Oudh.

GENERAL REMARKS ON MÁHÁMARI.

The Egyptian plague, the *Pestis Septica*, the *Gola rog* (bubo disease) of Garhwál is also known by the name of Máhámari (the great plague), under which name it was admirably described by Mr. Batten, of the Civil Service, in his letter to Government, North-Western Provinces, dated 1st January 1850. It is known from all other febrile diseases by the appearance (if the patient lives long enough) of buboes in the groin, in the armpit, or below the ear. It does not in any way resemble typhoid fever. There is no pain or tenderness in the right iliac region; no rose-coloured spots on the abdomen, or behind the shoulders; no diarrhœa, no well-marked morning remission; and lastly, death generally occurs about the third day, not about the twenty-first.

2. Of all known infectious diseases, with the possible exceptions of cholera and yellow fever, plague (*gola rog*) is the most rapidly fatal. Death generally occurs within three or four days of the first symptom, often much earlier. If the patient can survive the fourth day, the buboes in the groin and elsewhere either subside of themselves or suppurate, and he often recovers. A patient I saw at Darmyari on the 9th May was believed by his friends to have recovered, and to be out of danger. Although it was only eight or nine days since he was first attacked, he was able to walk about, and had a fair appetite.

3. Of all known disease, without any exception plague (*gola rog*) has the shortest period of incubation.

The period of incubation of cholera is about 48 hours.
Ditto of yellow fever about same.
Ditto of small-pox about 12 days.

whereas the period of incubation of plague is certainly less than 24 hours. Consequently any person who has no symptom whatever for 24 hours after visiting an infected place may consider himself safe. This well known law of Egyptian plague was well illustrated in the case of a woman who lived in the healthy village of Kheti in Sili Chandpur. She slept one night in the infected village of Khirsal in Sili Chandpur, and was attacked with plague next morning while walking home. She managed to reach her home, and the next day a child living in her house was attacked. No case ever occurred in any other house in Kheti village.

4. In Garhwál, as is well known, and as is mentioned by Dr. Renny, Dr. Pearson, Dr. Francis, and all other observers, the disease is remarkable from the fact that rats and mice often die in the houses in great numbers, some time before any human being is attacked. In some cases serpents are also found dead, and, though very rarely, jackals. Now rats and mice feed upon stored-up grain like human beings. Serpents feed upon dead or dying rats. Jackals occasionally feed on dead bodies of persons who have died of the plague. The relations of the diseased often flee to the jungles, leaving the dead bodies lying in the village. It therefore appears clear to me that the decayed grain is the cause of plague.

5. As far as is known, plague never occurs in cattle, sheep, or goats which feed on grass, shrubs, or rarely on growing corn.

6. As a rule, plague disappears in the hot weather. For this there are two reasons:—

1*st*.—Any temperature above 75° Fahrenheit destroys the infection of the Egyptian plague (Copland's Dictionary of Medicine, page 215, Part II).

2*nd*.—The new corn is cut in the hot weather, so that the villagers are no longer obliged to eat their old grain, even when it happens to be thoroughly decayed, as it now and then is. Of course the old grain is not decayed every year in every village, but it is occasionally, and then (I believe) it causes, if eaten, an outbreak of plague.

7. The disease always originates in out-of-the-way villages on high mountains, and spreads by infection to villages in the southern parganas; the reason being that the southern villages have a greater demand for their grain, and do not keep it in store for many years as out-of-the-way villages occasionally do.

8. The disease is much less prevalent in Garhwál than it formerly was. This is owing to the villagers having a much better market for their grain than they formerly had, owing to the great increase of the number of pilgrims who annually visit Kidarnath and Badrinath.

9. The outbreaks of plague which occurs in villages in Garhwál are of two kinds:—

1*st*.—Spontaneous outbreaks गोला रोग गांव मै आप उपजा

2*nd*.—Outbreaks caused by infection brought from previously infected villages गांव मै दूसरे गांव से मरके आया

1*st*.—When a spontaneous outbreak occurs, it will, I believe, be invariably found to have been preceded (or more rarely accompanied or followed) by a great mortality of the rats and mice in the village, showing that the grain has become poisonous. In these spontaneous outbreaks the mortality is very great, and the people do not escape the disease, even though they flee to the jungle, unless, indeed, they also leave their grain behind, and get grain from some other village. A good example of this form I saw in the village of Kharki, near Pokri, where all the 14 inhabitants of two houses died, most of them in the jungle.

2*nd*.—In outbreaks caused by infection from a previously infected village, it will generally be found that the person who brings the infection has slept a night in an infected house, or has eaten food in one. As an example of the former class of cases, there is the case of the woman of Kheti mentioned above, who slept a night in Khirsal. As an example of the latter class, there is the case of a barber of Pokri, who, leaving his village, then perfectly healthy, went and spent some hours in and got food from the spontaneously infected village of Kharki, where the 14 persons died. In the case of imported plague, it is generally confined to the house of the person who brings the infection. Villagers who do not live in his house always escape if they flee, and even the people of his house often escape if they flee early. Nothing therefore can be more distinct than the respective histories of a spontaneous and of an imported outbreak of plague. In the former the thing to be done is to burn the poisonous grain, and, perhaps, also the poisoned houses. In the latter to burn the one infected house and to send its inhabitants away from the rest of the village, and away from everybody else. In Garhwál spontaneous plague generally occurs in Rajput villages, imported plague both in Dom and Rajput villages, but more frequently in the former.

10. With regard to the treatment of persons who have caught the disease, it may be said to be all but hopeless. The only medicine I would give internally would be large quantities of common salt. The patients themselves sometimes look for it. Hyposulphate of soda might be tried if common salt was found useless. An emetic should be given if the patient is seen early. The common native treatment is to have the patient rubbed with oil of chándán (sandal-wood) and ashes. This seems to do good, but there is great danger to the person who rubs the oil and ashes in.

11. There is every probability that the disease originates owing to some peculiar and hitherto unknown fungus being generated in decaying grain. It is evident therefore that it would be most important to ascertain what kind of fungus it is, and on what kind of grain it first forms. I have examined a good many species of grain, but hitherto without any satisfactory result. With regard to the kind of grain on which the fungus first forms, I am inclined to believe that it is probably mandua (*Eleucine coracana*). Several things lead me to suppose this, the most conclusive being that I have heard that at Bált, in Kumaun, a quantity of mandua was sent from the infected village of Bált to be ground at a water-mill. The rats of the water-mill, who had previously been healthy, all died after the mandua came to the water-mill.

12. I would recommend that whenever the rats and mice of a village are reported as having died, the patwári of the place should be directed to send me specimens of all the kinds of grain the rats are likely to have eaten. This might possibly be managed, though it would certainly be very difficult. I intend to examine with the microscope any suspicious grain I can get hold of in Upper Garhwál. But it would be better if specimens for examination could be sent to Drs. Lewis and Cunningham of Calcutta, especially specimens of decayed chúá and mandua.

13. It must be remembered that although the first outburst of plague is caused by eating decayed grain, yet, when once established, the disease is virulently infectious and contagious. It is almost certain death to sleep in the same room with a person who is suffering from plague. It may therefore be easily understood that the disease is occasionally spread southwards, among people who are eating perfectly wholesome grain. In this way it may possibly now and then make its way down to the plains. But the hot weather soon stops its progress, as the poison cannot propagate itself at any temperature above 75° Fahrenheit, and after March it rarely happens that the night temperature in the plains is below 75°, and the day temperature certainly never is.

14. The hill people have an idea that dirt is to a certain extent a protection against infection. This, I think, is hardly probable. The infection is so virulent that the protection given by dirt must be very small indeed. Still I think it would hardly be wise to take a bath immediately before going into an infected village.

15. There is one remarkable fact connected with the Garhwál plague which is difficult to explain. It is, that thousands of pilgrims from the plains pass every year through the infected country; and often buy grain from infected villages, and yet very few of them ever take plague. I have only heard of two cases of pilgrims dying of this disease. They were men who came last year from Trijogi Narayan and died near the village of Unsari, not far from Okhimath, where plague last year caused a very great mortality. This happened in November, and at that season Okhimath is a cold place. I have asked a number of patwáris, a number of native doctors attached to the pilgrim dispensaries, and many other people, and they all agree in saying that pilgrims from the plains are rarely affected. Three explanations of this may be given:—

1st.—That the pilgrims generally wear cotton clothing, not woollen or hemp, like the hill men.

2nd.—The pilgrims rarely eat any of the kinds of grain which are peculiar to the hills, such as mandua (*eleucina*), chúá (*amaranth*), koni, jhangora, or china (three kinds of panicum). They live almost entirely on wheat, barley, rice, and dal, which we must therefore suppose are substances which are not poisonous, even when brought from a village where the inhabitants are dying of plague. Consequently the pilgrims escape spontaneous outbreaks.

3rd.—They are not very likely to suffer from infection, because they only enter the hills in April, and follow a route which keeps pretty close to the valley of the Ganges, where, from April to October, the temperature even at night rarely falls below 75° F. They are certainly in danger above Okhimath on the Kidarnáth road, and above Joshimath on the Badrinath road, but the pilgrims remain up in these cold regions as short a time as they possibly can. Besides the air up there is very dry. And Copland (page 219) says that the infectious power of Egyptian plague is greatest in

cold damp air; that it exists, but is not very powerful, in cold dry air; and that it does not exist at all in hot air, that is, any air whose temperature is above 75° F.

16. Mr. Batten in his letter of 1st January 1850, mentions the fact that European travellers and their servants escape unscathed, even when they pass through plague villages. Exactly the same explanations apply to this case as to the case of the pilgrims.

17. The experience of Dr. Renny, Dr. Pearson, Dr. Francis, and others has proved that a medical officer can without danger feel the pulse of a plague patient and give him medicine, and also that medical officers can without danger examine by dissection the body of a man who has died of the plague. That is to say, he can do these things by day, with the sun shining and the air tolerably warm. I do not believe he could do any of them with impunity after nightfall.

18. Northern Garhwál is divided into four parganas, Painkhanda to the north-east, Nagpur with its Sadabart pattis to the north-west, Badhan to the south, Dasoli in the centre. The habits of the people are identical, and the climate is very much the same in all the four. There is, however, a very great difference in their comparative liability to plague. Dr. Renny, in his notes for a report on Máhámari, dated 19th August 1850, writes in para. 1: "This remarkable "distemper first broke out in Garhwál in the year "1823. It began near Kidarnáth, and for some years "confined its ravages to parganas Nagpur and "Badhan." Nearly 27 years have elapsed since Dr. Renny wrote this, and during these 27 years there have been repeated outbreaks of plague in these two parganas, while there has rarely been any plague in Painkhanda or Dasoli, and yet the whole of Dasoli and part of Painkhanda lie between Nagpur and Badhan, separating the one plague district from the other. This year, in accordance with the usual law, there have been a great many deaths from plague in Nagpur and Badhan. There has not been a single death from plague in Painkhanda or Dasoli. I do not think sufficient attention has been paid to this remarkable phenomenon, and no explanation, as far as I know, has ever been attempted. From the year 1823 to the year 1877, that is to say for 54 years, two tracts of country have suffered in the most frightful way from a very peculiar disease, and two other tracts, which may be said to lie between them, have scarcely suffered at all. Temperature will not explain it. Of the two very cold parganas, Painkhanda and Nagpur, one is healthy and the other not. Of the two comparatively warm parganas, Dasoli and Badhan, one is healthy and the other not. The only possible explanation I can see is, that the main pilgrim road to Badrinath passes through the two healthy parganas, and that consequently the people have always had a good market for their grain. I must admit that the pilgrims on their way up pass through part of Nagpur; but Nagpur is a very large pargana, and, as a whole, derives very little benefit from the pilgrim demand for grain compared with the two healthy parganas Dasoli and Painkhanda. From Badhan the pilgrim road is a long way distant. The road to the Niti and Mana passes also runs through the healthy parganas, and is a long way from the unhealthy ones. I have no doubt the same law will be found to hold in southern Garhwál. Mr. Batten, in appendix to Settlement Report, Garhwál, (para. 12), page 153, states that in pargana Chandpur there are three pattis, Chándpur proper, Lohba, and Chaprakot. He goes on to state—"The people of Chaprakot have "not the benefit enjoyed by those of Lohba and "Chándpur of the pilgrim road running through their "district." Trusting solely to this, I will venture to predict that, if statistics can be obtained, it will be found that there is on an average of years more plague in Chaprakot than there is in Chándpur or Lohba. In other words, I will venture to assert that spontaneous outbreaks of plague depend solely on a want of market for grain. The law can be, however, better and more easily observed in large divisions like parganas, than in small ones like pattis. I have seen the disease myself in Chándpur and Lohba. I have not visited Chaprakot.

19. There is an anomalous form of plague which it is necessary to notice. In this form, which is comparatively a rare one, the disease commences by the patient vomiting considerable quantities of a yellow fluid. I am inclined to believe that this form of the disease is somewhat less fatal than the ordinary form. I, myself, have only seen one case, and in that case the patient recovered. Copland, in his account of the Egyptian plague, is apparently doubtful whether this form is more severe or less severe than the ordinary one. For he says, at page 198, "If vomiting be frequent or con- "tinued, if the matters ejected be black or unnatural, "death will ensue. When, however, vomiting is "moderate, and when it ceases after the evacuation of "green, greenish, yellow, or bilious fluids, a favourable "result often takes place."

20. The opinions I have formed regarding Garhwál plague are somewhat novel, and may not be generally accepted. It is not easy to prove them absolutely, but they might easily be tested in the following way by any person who is quite satisfied in his own mind that my explanations are incorrect. Let him come up to Garhwál and go into the house of a person suffering from plague after sunset on a cold damp evening, and let him feel the patient's pulse, and sit with him a minute or two. If the experimenter escapes having an attack of plague within 24 hours, my explanations are not worth much. After performing this experiment with impunity, the experimenter might proceed to eat a little chúá and a little mandua taken from a house where rats have been found dead within the previous few days. If he still escapes, my explanations will be shown to be worth nothing at all. I would recommend that the two experiments should not be performed on the same day, as, if the experimenter died, there might be doubt which experiment caused his death.

21. It is somewhat remarkable that, according to Mr. Davenport, a disease very much resembling Egyptian plague has recently been raging in the province of Yunnan in south-western China. In Yunnan, the disease seems to have followed a famine, caused by the destruction of property during the Muhammadan insurrection.

The disease is said to have first killed cats, rats, mules, and other quadrupeds, and then to have attacked human beings. The cats of Yunnan are thus apparently the representatives of the snakes of Kumaun, both feeding on rats. With regard to mules, they are probably fed on grain, to a certain extent at least. Hence they suffer, while the cattle and goats of Kumaun, which get no grain, escape the disease.

W. Watson, M.D.,
Superintendent of Vaccination,
Allahabad, Jhánsi, and Benares.

APPENDIX XXV. (1).

REPORT

OF AN

INQUIRY INTO MAHAMARI

CARRIED OUT UNDER THE ORDERS OF THE

INDIAN PLAGUE COMMISSION

BY

LIEUT. H. J. WALTON, I.M.S., and LIEUT. S. R. DOUGLAS, I.M.S.

I.—EXTRACT from a LETTER, No. 990, dated 31st March 1899, from the SECRETARY TO THE INDIAN PLAGUE COMMISSION to Lieut. WALTON and Lieut. DOUGLAS, containing INSTRUCTIONS for the INQUIRY.

I am directed to convey to you the following instructions for your guidance in making the necessary inquiry. The Commissioners desire you:—

(1.) To make, as far as possible, an exhaustive medical census of the districts which are reported to constitute an endemic focus of Mahamari, with a view to ascertaining within these districts the presence of either (*a*) typical plague, or (*b*) any atypical and less fatal form of plague:

(2.) To specially inquire into all cases of epidemic or contagious disease, to examine the blood in these cases by bacteriological methods, and to determine, so far as may be possible in each case, the nature of the infectious disease in question:

(3.) To collect samples of earth from any part of Kumaun or Garhwal which may be reported to be periodically visited by Mahamari:

(4.) Afterwards to examine the samples collected bacteriologically either at the laboratory of the Imperial Bacteriologist at Muktesar (if this should be practicable) or in Bombay, with a view to determining whether the plague bacillus, when introduced into the soil of the places from which the samples are collected, possesses any greater longevity than the plague bacillus when it is introduced into soils from places which are remote from the so-called endemic focus:

(5.) To send monthly reports of your proceedings addressed to me at the India Office, London:

(6.) And on completion of your inquiries to send in a complete report. This last report must be submitted in time to reach me before July 15th, 1899, and in view of this fact I am to remind you that it is very urgent that there should be no delay in commencing and carrying out your work.

Note.—The Commissioners subsequently extended the date by which the report should reach them till August 15th at latest, in order to permit Lieut. Walton and Lieut. Douglas to visit the passes from which traders come into Kumaun and Garhwal from Thibet, and to inquire into the possibility of the importation of Mahamari from time to time by such traders. The instructions were also modified by dispensing, on account of want of time, with the bacteriological examination of samples of soil collected in Kumaun and Garhwal.

II.—From Lieut. H. J. WALTON, I.M.S. and Lieut. S. R. DOUGLAS, I.M.S., on Special Duty with the Indian Plague Commission, to the SECRETARY, the Indian Plague Commission.

c/o The Commissioner of Kumaun,
Naini Tal, 26th July 1899.

SIR,

WE have the honour to forward herewith our report on Mahamari in Kumaun.

Owing to the absence of Mahamari from Kumaun this year, the chief object of our deputation, viz., the bacteriological verification of the nature of the disease, remains unfulfilled.

In the absence of an opportunity of investigating the disease itself, we devoted the time at our disposal to the collection of evidence of the clinical nature of Mahamari, and have given the results in our report.

We desire to bring to the favourable notice of the Indian Plague Commission the good services of, and great assistance rendered to us by, Paudit Raghubar Datt Yoshi, Officiating Deputy Collector of the Garhwal Sub-division of Kumaun. This officer was placed on special duty by the Commissioner of Kumaun, and accompanied us during the whole time that we were travelling. He obtained a great deal of information for us, and helped us in every way.

We wrote to the Director-General, Indian Medical Service, on July 3rd, informing him that we should forward our final report to the Indian Plague Commission on July 26th, and also that we had written to the Indian Plague Commission to learn whether they still desired us to carry out a bacteriological investigation of the samples of earth that we had collected in the Mahamari districts of Kumaun. The Director-General, Indian Medical Service, has directed us to await your reply to our letter of June 29th.

We have, Sir, the honour to be,
Your most obedient Servants,
HERBERT J. WALTON, Lieut., I.M.S.
S. R. DOUGLAS, Lieut., I.M.S.

REPORT.

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I.—Districts visited.
II.—General Sketch of Kumaun.
III.—The Mahamari Districts.
IV.—Villages visited, and summary of evidence of the nature of Mahamari.
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VI.—Discussions of points connected with Mahamari.

APPENDICES.

A.—Evidence obtained from villages visited.
B.—List of epidemics of Mahamari.
C.—The trade with Thibet.
D.—Map of Garhwal and Almora.

I.—DISTRICTS VISITED.

We arrived at Naini Tal on April 5th, 1899, and spent four days in examining the records of Mahamari preserved in the office of the Commissioner of Kumaun. On April 9th we left Naini Tal, and proceeding *viâ* Almora and Ranikhet, entered Garhwal on April 17th. We marched, *viâ* Lohba and Karnprayag, to Guptakashi, where we spent several days visiting the villages of Phali, Semi, and Sankari in Pargana Nagpur.

In 1896-97 an epidemic of Mahamari prevailed in these villages; this is the most recent occurrence of the disease that has been reported either in Garhwal, or the Almora district of Kumaun.

From Guptakashi we went to Kidarnath, making careful inquiries *en route* as to the occurrence of Mahamari among the pilgrims going to Kidarnath, or in the villages in which they halted on this road; the disease appears to be quite unknown among them.

From Kidarnath we returned to Ukhimath, a village situated opposite Guptakashi, across the Kali river. Here we visited Chunni village, which suffered from the epidemic in 1896–97, as the villages previously visited on the other side of the valley.

We then marched to the villages at the foot of the passes leading into Thibet, viz., the Mana and Niti Passes. In neither of these villages is Mahamari ever known to occur, but as they are the two routes by which the Thibetan trade enters Garhwal, we thought it advisable to visit them.

From the Niti pass we went to the Almora district of Kumaun, visiting some villages situated two marches to the East of Bageshwar which had been attacked by Mahamari in 1893, and some villages near Pithoragarh where there had been an outbreak of Sanjar in the spring of the year.

From Pithoragarh we returned to Almora and examined the records in the Deputy Commissioner's office. Thence we went to Naini Tal, arriving there on July 16th. We were occupied until July 26th in writing this report.

We marched on 68 days, covering a distance of 641 miles, and halted for 30 days, between April 9th and July 16th.

II.—General Sketch of Kumaun.

Most of the following information is extracted from the *Gazetteer* of the North-West Province.

The area of Garhwal is about 5,500 square miles. "The Alaknanda river and its tributaries drain the entire district and form the valleys, which are as a rule much narrower, and contain less arable land, than those of Kumaun. . . . The entire drainage of Garhwal flows into the Ganges. . . . The soil varies greatly in different valleys; that of the Alaknanda is somewhat sandy, that of the Pindar amd Ramganga is reddish clay, and that of the Nyar is clay mixed with shingle. . . . The beds of all the rivers consist of hard rock and gravel with a little sand, and little erosion takes place. Diluvion, owing to the sudden floods, occasionally takes place; but alluvion, in the sense it is used in the plains, can never occur. . . . Owing to the natural features of the country, any general statements, regarding the climate, are subject to great variations. Towards the passes into Thibet there are no periodical rains, while, in the hottest weather, it is cool. In the portions bordering on, and to the south of, the snowy range, it is always cool, but more moist; while in the rest of the hills the temperature varies, and in the valleys it is intensely hot and feverish during the hot weather and rains, and bitterly cold during the nights and mornings, though warm in the daytime. . . . The average rainfall at Pauri is about 48·4 inches, and at Srinagar 37·1 inches."

The valleys vary in elevation from about 3,000 to over 12,000 feet, the majority being about 6,000 feet above sea level. The hill-sides are largely covered with tree forest, and surrounding the villages is generally a little terraced cultivation. The valleys are, for the most part, narrow and steep, and communication between villages, on opposite sides of a valley, is often difficult.

The population of Garhwal was, at the census of 1891, 407,818, of whom 403,603 are Hindus, the majority of whom are Brahmans, the Musalman and other elements being quite insignificant.

A typical Garhwal village differs considerably from those of the plans of India. It is almost always very straggling, and consists rather of several very small groups of houses, often separated from their neighbours by distances of 100 yards and more. The houses are fairly substantially built of stone, with wooden beams. They are generally two-storeyed, the ground floor being used to store grain and implements, and to house cattle. The upper storey consists of two or three small dwelling rooms. Notwithstanding the "Mahamari rules," * windows are still very small or absent, and the rooms are very dark and quite unventilated.

In former reports, we noticed that attention is frequently drawn to the amount of manure and filth that had been allowed to accumulate in the lower storeys and in the neighbourhood of the houses. This condition of affairs is very much improved now; indeed. the actual village sites struck us as being very clean. It would, however, be a great advantage if the inhabitants could be induced to be equally particular about the condition of the land in immediate proximity to the villages. This applies much more strongly to the villages, or rather, halting places for pilgrims—along the routes to Kidarnarth and Badrinath. The accumulation of faeces actually in and about these places is enormous, and, as no steps are taken to remove it, they are most unsavoury, and even dangerous.

The area of Kumaun is about 8,000 square miles, but a good deal of this, as in Garhwal, is practically uninhabited. As a whole the physical features of the Almora district of Kumaun resemble those of Garhwal, but the land elevations are usually less, the valleys more open, and there is more cultivation. The rainfall is heavier, but varies immensely, even in neighbouring districts. The average temperature too is higher. The population consisted at the census of 1891 of 563,181 persons, of whom 549,572 were Hindus.

III.—The Mahamari Districts.

The following parganas in Garhwal have been attacked at one time or other, by Mahamari: Nagpur, Badhan, Dewaigarh, Dasouli, Chandpur, Mallasalan, and Chandkoti. Of these, the most frequent sufferers have been Nagpur, Badhan, Chandpur, Dewalgarh, and Mallasalan. Chandkoti has had only one epidemic in 1859–60, whilst only two villages in Dasouli have ever been affected (in 1864).

In Almora, Mahamari has occurred in parganas Danpur, Johar, Barahmandal, Pali, Gangoli, and Darma. Prior to 1848 Mahamari was unknown in the Almora district. Since then the worst epidemics have been in Danpur and Barahmandal; the other parganas have only suffered slightly.

It will be noticed that pargana Badhan—one of the worst districts—although, for administrative purposes, included in Garhwal, immediately adjoins those parganas of Almora in which Mahamari has occurred, notably Danpur.

Badhan is separated from the other Mahamari districts of Garhwal by the large pargana of Dasouli, which, with the above noted exception—in 1864—has hitherto escaped. Dasouli is a populous district, and is traversed by a much frequented road leading from Yoshimath to Bageshwar, and thence to the east of the Almora district. Since Dasouli is bordered by Chandpur, Nagpur, and Badhan, all of them very bad districts, the immunity it has hitherto enjoyed is very surprising.

IV.—Villages visited and Summary of Evidence of the Nature of Mahamari.

(1.) *Phali.*

A village of eight families (visited on April 27th, 1899), situated on the top of a mountain, about 6,000 feet above the sea level, facing the north-east. The village is about 1,500 feet above the level of the river Kali, and is reached from the pilgrim road by a very steep rocky path beginning at the bottom of the valley. It is surrounded by terraced cultivation, and there is an entire absence of trees in the neighbourhood of the village, which is consequently fully exposed to the direct rays of the sun.

The nearest village to Phali is Lamgodi, which is about a quarter of a mile off. The inhabitants of Phali are all more or less related to one another, and are Pandas—family priests—and nearly all spend the winter in the plains, the village being practically deserted.

An epidemic of Mahamari was reported at Phali in 1853. The last epidemic was in 1896 from August to October, during which there were nine cases with six deaths.

Dates of Deaths.

1. July 31st. Ghuri, female, aged 15 years.
2. August 18th. Guma, female, aged 7 years.
3. August 24th. Rubra Datt, male, aged 4 years.
4. August 25th. Hira, female, aged 13 years, sister of No. 2.
5. August 27th. Gusain, male, aged 9 years.
6. October 20th. Jhasi, female, aged 40 years.

* *See* Appendix No. XXVI. in this Volume.

The following were attacked and recovered:—

1. Malda, female, aged 3. She was seen by us and had a scar on the neck, which was said to have been where the bubo burst.

2. Bhawani Parshad, male, aged 22, who has since left the village, but was said to have had a bubo which suppurated, and who convalesced in about three weeks.

3. Maragan, male, aged three.

We saw some cases of measles which were occurring at Phali at the time of our visit.

From the evidence of some of the villagers who were present at the time of the epidemic, it appears that the first case—the girl named Ghuri—had paid a visit to the village of Sang, which is about two miles from Phali, two days before she was taken ill. There was no recognized Mahamari, and no deaths occurred in June, July, or August at Sang. This girl was ill for five days, a swelling appearing on the right side of her neck on the third day.

After this girl's death some rats were noticed to fall down from the roof and die suddenly, and in consequence of this the people thought the disease must be Mahamari, and evacuated the village.

Two other cases, viz., Guma and Hira, were said to have been ill three and four days respectively, the first having a swelling on the left side of the neck, the last on the right side of the neck, both appearing about the third day.

(2.) *Semi.*

A village about 250 feet above the river level, and a quarter mile higher up the valley than Phali, and facing east. There is very little jungle round the village.

At the time of the last epidemic of Mahamari in 1897 there were 12 families, but at the time of our visit there were only three families living in one house, the other houses being in ruins and overgrown with weeds. There have been three epidemics of Mahamari in Semi. The last epidemic occurred between February and April 1897, the dates of the other two are not known.

In the epidemic of 1897 there were 24 cases and 18 deaths.

Dates of Deaths.

1. February 2nd. Kunja, female, aged three years, daughter of No. 17.
2. February 11th. Tara, male, aged —, son of No. 3.
3. February 21st. Lachmi, female, mother of No. 2, wife of one Panchana, who recovered and was seen by us.
4. February 22nd. Parbatti, aged 15 years, sister of No. 5 and daughter of No. 15.
5. February 22nd. Ganga, male, aged six years, brother of No. 4, son of No. 15.
6. February 22nd. Gangotra, female, aged 11 years.
7. February 28th. Sisua, male, aged 45 years.
8. March 1st. Gangua, male, aged 32 years, husband of No. 9 and son of No. 10.
9. March 1st. Ghungara, female, aged 16 years, wife of No. 8.
10. March 1st. Kali, aged 55 years, mother of No. 8.
11. March 8th. Ghori, aged 15 years, sister of Ude Singh, who recovered from the disease and was questioned by us.
12. March 10th. Kooria, aged 18, wife of No. 14.
13. March 11th. Swati, aged 12, sister of Ude Singh.
14. March 13th. Chandaran, aged 45, husband of No. 12.
15. March 15th. Kidaru, aged 40, father of No. 4 and No. 5.
16. March 15th. Baisakhu, male, aged 50, a non-resident of the village, who was living with No. 14.
17. March 19th. Atma, aged 35, father of No. 1.
18. April 8th. Bhaga, aged nine, son of Panchana.

Six other people were attacked and recovered, two of whom we saw. These two men stated that the village was not evacuated till about three weeks after the first case, as the disease was not recognised as Mahamari. In describing their own symptoms, one informed us that the illness commenced suddenly with shivering and headache, he had continued fever, and the third day a swelling appeared in the right axilla, which remained for about eight days and gradually disappeared without any suppuration; the other man stated that the commencement was also sudden, on the second day a swelling appeared on his back (at the time of our visit there was a large oval scar over the inferior angle of his right scapula), his fever was continuous, and he was very ill for five or six days. Neither witness remembered seeing or hearing of any dead rats. In nine of the cases seen by these two men, the first three had no buboes, but the remaining six had swellings of some sort.

(3.) *Sankari.*

A rather larger village than Semi, situated a little higher up the valley and about thre-quarters of a mile south of Guptakashi, and at about the same altitude (5,000 feet). It is situated on the side of a hill about a third of the way from the top. About 17 families inhabit the village, most of whom are Rajputs, as they are at Semi.

In September 1896—there was a former epidemic in 1853—Mahamari broke out in one house containing nine inmates, five of whom were attacked and died. The village was evacuated after the second death, and no other house or family was attacked.

Dates of Deaths.

1. September 14th. Lalmutti, female, aged 30, step-mother of a man named Tota Ram, whom we saw at the time of our visit.
2. September 14th. A child aged two months, daughter of No. 1.
3. September 26th. Shama, aged five, sister of No. 2.
4. September 27th. Munga, female, aged six, cousin of Tota Ram.
5. October 10th. Mohan Singh, aged 46, father of Tota Ram.

This outbreak was seen by a Hospital Assistant, who said it was Gola Rog. Very little evidence could be obtained about the cases; death took place after from one to five days' continuous fever. A bubo was only remembered in one case.

This epidemic at Sankari was going on at the same time as the one already described at Phali, but the villagers at Sankari stated that there had been no communication with those of Phali, as they were of different castes.

(4.) *Chunni.*

A village on the left bank of the Kali river near Ukhimath, attacked by Mahamari in November 1895, and visited by us on May 8th, 1899. It consists of a village of about 16 houses, lying about 500 feet above the river. It lies higher up (about 2½ miles) the valley than the villages of Semi, Phali, and Sankari, and is about one mile from Ukhimath. It is about half a mile from Mangoli, where there was an epidemic of Mahamari in 1874–75. The village is surrounded by cultivation, and there are very few trees near it. There was a previous epidemic at Chunni in 1859. The last epidemic commenced in November 1895. In November there were two cases:—

1. A girl, named Janaki, aged about three years, died on November 5th.
2. A woman, named Kodi, aged 24, the mother of No. 1, died on November 12th.

The inhabitants then evacuated the village, but some of them returned to it about the end of December We were unable to ascertain whether any attempt at disinfection had been made in the meantime.

In the middle of January two fatal cases occurred amongst children who had been living in the jungle ever since the first evacuation of the village.

Dates of their Deaths.

3. Sialku, male, aged 4, January 18th.
4. An infant, aged 19 days, January 15th.

On January 19th two cases died amongst those who had returned to the village:—

5. Ganga, female, aged 24 years.
6. Rupi, female, aged 40 years.

About a fortnight later a man named Shib Ram, aged 40, who had left the village at the time of the first evacuation and had remained in the jungle ever since, was attacked. He had fever for three days, when a bubo appeared in the left groin. This suppurated for about 10 days, leaving a depressed scar, which was seen by us. He eventually recovered. His

wife and two children, who were living with him in the same hut, were not attacked.

No evidence could be obtained as to the origin of this epidemic, no food or clothes having been introduced from without, nor had any stranger visited the village.

Two or three days before the first case occurred one of the villagers saw a dead rat, and noticed a bad smell about the house in which the case occurred. The jungle round the village swarms with monkeys, but neither sick nor dead ones were noticed.

After the recurrence of the disease in January 1896, the village was entirely re-evacuated for about three months, and the houses in which cases had occurred were burnt.

Most of the cases which occurred in the village were seen by the Patwari and a Hospital Assistant who had charge of the Dispensary at Ukhimath.

Surkali and Suini.

Villages near Bageshwar, where there was an epidemic of Mahamari in 1893, visited on June 21st, 1899.

The villages of Surkali and Suini are situated in a large simi-circular valley facing south, about two miles from the Bageshwar road, and scattered along the hill-side in groups of two or three houses, at about 6,000 feet elevation above sea level. The land of these hill-sides is all under cultivation, except the hill-tops, which are covered with bush jungle. The inhabitants are nearly all cultivators, with a few Banniahs. From November to May, Bhutias from Johar, in the North of Kumaun, come to these villages to exchange salt for rice; with this exception there is very little trade.

The first epidemic of Mahamari was in August 1887. Six deaths occurred, and the outbreak was confined to Surkali.

Surkali is a very straggling village, consisting of about 20 families, the groups of houses being so far apart that it practically amounts to three or four very small hamlets.

The last epidemic of Mahamari occurred in July 1893. There were 11 cases—all fatal. The people attacked belonged to two families of Banniahs. About one month later, three fatal cases occurred at Suini, which is the name given to two houses situated about a quarter of a mile to the east of, and a little lower than, Surkali.

The Patwari of Patti Nakuri, in 1893, visited Surkali during the epidemic, and saw all the sick and gave food to some of them. He told us that the course of the disease was identical in every case; after two or three days' fever, swellings appeared in the armpits or groins, and death followed in two or three days more. None of the buboes suppurated. Three of the bodies were buried, the rest were burnt. The two houses in which the cases occurred were burnt. He saw three or four dead rats round the village.

The origin of the epidemic is unknown: Mahamari was not reported in any other part of Almora or Garhwal at that time.

The inhabitants of all the groups of houses in the valley evacuated their villages as soon as the disease appeared at Surkali. They remained in the jungle about two months, and only the inhabitants of Suini were attacked.

At the time of the epidemic Suini consisted of two houses only, the inhabitants of only one of which were attacked. These were two brothers, their mother, and an uncle. When the disease broke out in Surkali, these four people evacuated their house. About one month later, one of the brothers returned to his house. He was at once attacked with fever and remained in the house, his mother coming in to look after him. A few days later the other brother came in and was also attacked; both died and were buried by the old woman. This woman is still alive, but has left the neighbourhood. Meanwhile, the uncle who had remained in the jungle, living alone, and had had no communication with the village, was found dead a few days after his nephews' deaths. The nature of his illness could not be discovered.

Poona Gir, father-in-law of one of the brothers, came in to see his son-in-law during his illness. He returned to his own village, Majhera, where he and one of his daughters shortly afterwards died of Mahamari. No other cases occurred. Majhera is a small village about three miles east of Suini.

This epidemic was visited by Drs. Thorold and Giles, who did not, however, arrive in time to see any of the cases.

V.—Previous Conclusions as to the Nature of Mahamari.

(I.) In 1850 a report was published in which Doctor Renny, Assistant Surgeon Pearson, and Hospital Assistant Sreenath Mookerjee stated that they saw several cases of Mahamari in the patti of Chaprakot, and considered it identical with typhus fever, with glandular enlargements; and that the cause of the disease was the filthy habits and habitations of the people.

(II.) In 1852, Assistant Surgeon Pearson and Hospital Assistant Sreenath Mookerjee visited some places in the Munshari district, and came to the conclusion that the disease was plague. They described the occurrence of buboes and carbuncles, and also the death of rats in the affected villages. Dr. Renny, however, did not agree with them, still thinking the disease was typhus fever.

(III.) In 1876 Dr. Planck, as the result of a long investigation, came to the following conclusions*:—

(*a.*) That the disease he saw was identical with plague.
(*b.*) That it was then endemic in Kumaun.
(*c.*) That the causes are insanitary conditions and poverty.

Dr. Watson, in an appendix* to Dr. Planck's report, thought the cause of the disease was the consumption of a grain called mandua, after it had been stored for some time.

(IV.) In 1894 Dr. Hutcheson, Sanitary Commissioner to the North-Western Provinces and Oudh, gave the following opinions of various investigators:—

In 1853, when the disease spread to the plains and was seen by Dr. Stevens, it was considered by him to be plague. In 1884–85 the disease was seen by Dr. Richardson, who pronounced it to be typhus fever. In 1886 Dr. Thomson, in a report on the outbreak, considered it identical with typhus fever. Again, in 1888, Dr. Thomson also had the opinion that "Mahamari," "Gola Rog," and "Phutkia Rog," were native names for typhus fever.

Dr. Hutcheson does not give any opinion on the nature of the disease, but states that in his opinion the cause is general insanitary conditions, and the filthy habits and customs of the people.

VI.—Discussion of Points connected with Mahamari.

(*a.*) The meaning of "Mahamari" and "Sanjar."

The terms "Mahamari" and "Sanjar" appear to have been used synonymously in some part of the former reports, and to have caused some confusion.

"Mahamari" is an official term, and, when used by people of Kamaun, signifies any epidemic disease with a high mortality, including cholera; the disease in which buboes appear is called by the people themselves "Gola Rog" or "Phutkia Rog."

They use the word "Sanjar" to denote an epidemic, the mortality of which is slight; under this term is included what is evidently relapsing fever.

(*b.*) The presence in Kumaun of epidemic diseases other than Mahamari.

We were especially on the look-out for other epidemic diseases, and made careful inquiries on the subject in all the districts that we visited; we also inspected the mortality returns of the Patwaris, but were unable to detect any excessive mortality anywhere. The only epidemic diseases that we met with were measles and Sanjar.

An epidemic of measles was prevailing in May in several villages in the neighbourhood of Guptakashi, including Phali village, which had been attacked with Mahamari in 1896–7. We saw the cases, and they were undoubtedly typical cases of measles, confined to children.

In May, we received information of an outbreak of Sanjar in some villages near Pithoragarh, in the East of the Almora district, and close to the Nepal Frontier. At the time that we heard of this outbreak, we were at quite the other side of Kumaun, and as the epidemic was said to be almost over we were unable to visit it at the time. In June we heard that another village in the same district, had been attacked. We proceeded as rapidly as possible to the spot, but the epidemic was over by the time we reached Pithoragarh. We saw the

* *See* App. No. XXV. in this Volume.

convalescent patients, and they gave us a clear account of the disease. There seems no doubt that—whatever different diseases the term "Sanjar" may include—in this particular instance, it was relapsing fever. The symptoms that they described to us were as follows:—Continued fever of sudden onset, lasting for five or six days; then a sudden remission lasting, on an average five days, followed by a sesond access of fever. In one of these cases, at least, there was a distinct history of jaundice. There were no buboes; no rash was noticed.

Captain Rogers, I.M.S., visited a village in which Sanjar had occurred in February of this year. From one patient, who still had fever, he obtained a specimen of blood, which he saw at Muktesar. This specimen showed spirilla in small numbers.

Other occasional epidemic diseases, of which we have heard in Kumaun, are cholera, small-pox, and influenza.

(*c.*) The identity of Mahamari with Plague.

As to the identity of Mahamari with plague, we are, of course, unable to speak positively as we did not meet with any cases of the former, and the matter can only be definitely settled by a bacteriological investigation. In the absence of such proof, we are obliged to base our opinion on the description of the disease, given by persons who have seen it, or suffered from it.

The symptoms that they describe, and about which there is complete unanimity, are briefly, as follows:—A very short incubation period, followed by sudden onset of fever, which is continuous; then, after three or four days, the appearance of swellings in the groins, armpits, or neck; these sometimes suppurate; there is complete prostration from the first, and the patient usually dies in the course of a week or less; sometimes without the appearance of buboes. The case mortality is exceedingly high, and agrees entirely with our experience of plague in other parts of India.

In many of the epidemics whose history we traced, the occurrence of dead and dying rats was a prominent feature, and this fact is well recognised by the villagers themselves, as also the danger of entering houses in which cases of Mahamari have recently occurred. In several instances we obtained definite evidence of people being attacked shortly after returning to Mahamari houses, even after they had been evacuated for some weeks.

Our own opinion on the matter, therefore, is, that those forms, at least, of Mahamari that are known to the inhabitants of Kumaun as "Gola Rog" and "Phutkia Rog" are identical with true plague, although, as pointed out above, positive proof of this identity is wanting in the absence of bacteriological confirmation.

As to the existence of an atypical and less fatal form of plague, there is no evidence in favour of such a view, and the accounts given to us by the inhabitants of villages which have been attacked by Mahamari do not, in any case, refer to such a disease.

(*d.*) The importation of Mahamari from without.

The Indian Plague Commission raised the question whether any evidence could be obtained of the importation of Mahamari from other countries, especially Thibet, with which Kumaun is known to have trade relations. In order to obtain information on this point, besides making inquiries on the subject from other quarters from which it appeared possible that evidence might be obtained, we visited the villages inhabited by the traders who go into Thibet by the Mana and Niti passes.

Along the upper part of the roads leading into Thibet are several villages, inhabited during the season by the Bhutias, who carry on this trade. During the winter, when the passes are closed, these villages are deserted, and the traders proceed down country to dispose of the merchandise that they have accumulated during the season. It is obvious, therefore, that if Mahamari did occur in Thibet, these traders might be the agents by which the disease was introduced into Garwhal. But a striking feature in the distribution of Mahamari in Garhwal is that the villages on these Thibetan roads and the adjacent districts have hitherto never been attacked by the disease. Pargana Nagpur, in which Mahamari has so frequently appeared, seems to have less trade with Thibet than any other part of Garhwal. We made numerous inquiries from the traders as to whether they had ever known, or heard of, the existence of epidemic diseases in the parts of Thibet that they habitually visit, but they all agree that diseases were unknown to them.

At Niti we had an interview with two Thibetans, who had just crossed the pass to make arrangements for carrying on the year's trade. Besides settling the "rate of exchange," and similar matters relating to the trade, one of their duties is to ascertain if any epidemic disease is prevalent in Garhwal, and, in the event of such being the case, to impose what appear to be very sensible restrictions regulating the method by which the trade shall be carried on, and reducing the personal intercourse between Garhwalis and Thibetans to a minimum.

We were fortunate enough to have a long conversation, through the medium of an interpreter, with these two "envoys." They appeared to be intelligent men, and showed no objection to replying to the questions that we put to them. We questioned them closely, both directly and indirectly, as to the diseases that occurred in their country, but they emphatically denied the existence of any disease presenting even the most remote resemblance to Mahamari. On the other hand, they appeared to be fully aware of the occasional existence of epidemic diseases—Gola Rog, cholera, &c.—in Garhwal, and considered the latter an unhealthy country compared with their own.

While we were in the Almora district, it was suggested to us by several persons—old residents in the district—that, as Mahamari was said to occur in Nepal, the latter country might be the source from which epidemics had been imported into the Almora district. We found it almost impossible to obtain reliable information on the subject. One man, a kind of Customs officer in the service of the Nepal Government, who lives on the Nepal frontier, told us that he had heard of an epidemic occurring some 30 years ago in the west of Nepal. After our return to Naini Tal we received a letter from him, in which he said that a disease, that he called "Phutkia Rog," had prevailed this year in about the same districts, and that several deaths had occurred.

Here again, however, one would have expected that, if Mahamari were introduced from Nepal into Almora, the district immediately adjoining the frontier would have been amongst the first to suffer. But the Almora districts, in which Mahamari is known to have occurred, are separated from Nepal by a wide area from which Mahamari has never been reported.

(*e*) There does not seem to be any necessity to invoke several distinct importations of Mahamari into Kumaun in order to account for the different outbreaks that have occurred there. The impression derived from the examination of the various official reports that have been written on the subject of Mahamari leads one to suppose that numerous and long intervals of time have intervened between the different outbreaks, and that this must be accounted for either by fresh importation, or by the latency of the contagion during these years. But, on making inquiries on the spot, we soon came to the conclusion that mention of all the outbreaks that have occurred is not to be found in the official reports. We therefore caused lists to be prepared by the Patwaris of the different districts of all the occurrences of Mahamari of which they had records. By combining these records with those given in the different reports, we find that nearly all these gaps are filled in. It is, of course, possible that in a few instances the Patwaris' reports may not have been quite accurate, but it seems more probable that the inaccuracies would be rather in the direction of omission than in unwarranted inclusions; for limited outbreaks of the disease, especially if occurring in small and isolated villages, might easily have been overlooked.

There does not appear to be any difficulty in reconciling such gaps as exist in the following list (which shows the outbreaks of Mahamari from 1870 to 1897), with the idea that the disease is endemic in Kumaun; for one has seen instances during the last two years of villages in the Jullundur district of the Punjab (*e.g.*, Shikohpur, Sahlon) being re-attacked with the plague after an interval of 12 months. There seems to be no evidence of plague having been re-imported into these villages, and on *à priori* grounds it is improbable that such small and obscure villages should have, in successive years, been re-infected from without.

LIST of OUTBREAKS of MAHAMARI in GARHWAL and ALMORA DISTRICTS, compiled from the Patwaris' Reports and Official Records since 1870.

Year.	Garhwal.	Almora.
1870	Chandpur - - -	——
1871	Badhan, Chandpur - -	——
1872	——	——
1873	Nagpur - - -	——
1874	Badhan - - -	——
1875	Badhan, Nagpur - -	Danpur.
1876	Badhan, Nagpur, Chandpur	Danpur, Barahmandal.
1877	Nagpur, Dewalgarh - -	Danpur, Barahmandal.
1878	Badhan, Nagpur, Chandpur, Dewalgarh.	Barahmandal.
1879	Maharsalan - - -	——
1880	——	——
1881	——	——
1882	- - - - -	Danpur, Pali, Darma.
1883	Dewalgarh - - -	Pali, Darma.
1884	- - - - -	Darma.
1885	Badhan, Chandpur - -	Pali.
1886	Chandpur - - -	——
1887	Badhan, Nagpur - -	Pali, Danpur.
1888	Nagpur - - -	——
1889	——	——
1890	——	——
1891	Chandpur, Badhan - -	——
1892	Maharsalan - -	——
1893	- - - - -	Danpur.
1894	Chandpur - - -	——
1895	Nagpur - - - -	——
1896	Nagpur - - -	——
1897	Nagpur - - -	——

Years when no Mahamari was known: 1872, 1880, 1881, 1889, and 1890.

The conclusion to which we have arrived is that Mahamari is almost certainly truly endemic in Kumaun, and that it is, most probably, identical with the plague now occurring in the plains.

As regards this endemic focus of the disease being a possible source of danger to the rest of India, we think that such a danger is very small. Although at times it has prevailed with great severity the disease, except in one instance—in 1852,—has remained confined to certain definite and isolated districts. The distances that separate the Mahamari districts of Kumaun from the plains of India are so great, and, owing to the mountainous nature of the country, the communication is so slow, that these two factors seem to constitute an efficient obstacle to the spread of the disease by individual travellers, and if the disease broke out with great severity steps could be easily taken to prevent its spreading.

On the other hand there is an annual stream of pilgrims, numbering several thousands, who come from all parts of India, passing up and down the Ganges valley from Hardwar to Kidarnath and Badrinath—the former situated in the Pargana of Nagpur, which has suffered from Mahamari more frequently than any other part of Garhwal—and there is the Panda population, inhabiting the same district in the summer, who spend the winter in various parts of the plains. These two classes undoubtedly might be a source of danger, especially if an epidemic broke out amongst them; but in the case of the pilgrims, at least, information of any epidemic would be easily obtained from the Hospital Assistants in charge of the numerous Dispensaries that are situated along the pilgrim routes. The Pandas of the Kidnarnath temple live during the summer in villages along the pilgrim routes, in Pargana Nagpur. During the winter they proceed to the plains, visiting the North-West Provinces, the Punjab, the Central Provinces, and some parts of Bengal and Bombay, in order to persuade people to perform the pilgrimage to Kidarnath during the next year. It should also be mentioned that a considerable number of Garhwalis resort every year to the Hill Stations—Naini Tal, Mussoorie, Chakrata, Simla, &c., and take service there as coolies and jhampanies. In the case of Mahamari being prevalent in Garhwal, these men might be a source of danger unless subjected to efficient supervision.

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Lieut., I.M.S.
S. R. DOUGLAS, M.R.C.S., L.R.C.P.,
Lieut., I.M.S.

Naini Tal,
th July, 1899.

APPENDIX A.

EVIDENCE regarding MAHAMARI obtained from VILLAGES visited by Lieut. WALTON, I.M.S., and Lieut. DOUGLAS, I.M.S.

(1.) Village Semi. Pargana Nagpur.

Witness I.—Panchana, Caste Rajput.

He had Mahamari at the time of the epidemic. He stated that after the first death the inhabitants remained in the village about three weeks as they did not recognize the disease as Mahamari, but began to suspect it when his wife and first child were attacked. Tara died after three days' fever; no buboes or cough noticed. Lachmi died after three days' fever; bubo in right axilla, noticed on second day. Manga was also taken ill about the time when witness was ill. She had a swelling on the scalp which suppurated. Bhaga was taken ill in the jungle and died in three days; bubo in right axilla, noticed on second day.

Witness' illness. He was taken ill in the village at the same time as Tara. The illness came on suddenly with fever and headache; the next day he felt the swelling on his back (there is now a large oval scar on the angle of his right scapula); he was confined to his bed for eight or ten days, the fever lasting about ten days, being very severe for five or six days and having no intermission; he went to live in the jungles. No strangers had been to the village, nor had anybody left it, nor had any merchandize been imported into it, that he can remember. He knows nothing about the other cases. He neither saw nor heard of any dead rats being found.

Witness II.—Ude Singh, Rajput.

Two sisters died on the 8th and 11th March, names Ghori and Swati, and he himself suffered from the disease. Both his sisters were taken ill in the jungle. Ghori was taken ill first and died in four days; bubo in right axilla noticed on third day. Swati was taken ill about eight days afterwards, and died in three days; a bubo in the right axilla appeared the day before her death. Witness saw no dead rats. He was the last to be attacked in the village. The illness came on suddenly with shivering, headache and fever. On the third day a swelling was noticed in the right axilla. Fever was continuous for four or five days, the swelling lasted eight days, and did not suppurate, after which he convalesced. He saw Panchana's wife and child, also Atma's child, who had no bubo or cough.

(2.) Phali Village.

Witness I.—Durga Datt, caste Panda, cousin of Ghuri.

He saw that Ghuri had fever and vomited once or twice; on the third day a swelling appeared on the right side of the neck; she died on the fifth day of the illness. Ghuri had visited her father's house (which is in a village called Sang, about two miles away from Phali) two days before she was taken ill. No Mahamari was reported, or thought to be, at Sang. No strangers had visited the village for 10 or 12 days, nor had any merchandize been lately brought to it. Witness stated that three days after Ghuri's death he noticed two rats die in the following way:—They fell from the roof, kicked about several times, and then died; this sudden form of death in rats is considered by the hill people to be a sign that they died of Gola Rog. He did not notice any swelling about the rats. After the death of the rats, the whole population moved out into the fields below the village. Guma was the next attacked; she did not live in the same house nor did she have anything to do with Ghuri.

This evidence was corroborated by Harbati, brother of Guma and Hira, who stated that Guma was ill three days, and a swelling on the neck, on the left side, was noticed on the third day. Hira was ill four days; a swelling appeared on the right side of the neck on the second or third day.

No relations of any of the cases, either that died or recovered, could be obtained as witnesses.

Witness II.—Baij Ram, of Signoli village.

Stated that he visited Phali, and was in Bholanath's house (Ghuri's husband) the day after her (Ghuri's) death. He saw a rat drop from the roof, spin round

and round and then die; he also saw five or six dry bodies of rats in Ghuri's house, after the villagers returned to their houses, about four months afterwards. He did not touch the rat, but removed it with a stick. No other animals were noticed to die either in the houses or jungle.

(3.) Sankari Village.

Witness I.—Tota Ram, Rajput.

All the five cases were related to him. There were nine inmates in the house: five deaths occurred. Nobody else in the village was attacked. Two of the cases died in the house, and the whole village moved out into the jungle, where the remaining three died. The villagers knew that Mahamari was occurring in Phali, but had no communication with the inhabitants of Phali, being of different castes.

He did not see or hear anything of dead rats.

He remembers very little about the cases. Lalmutti had fever and headache; her illness lasted five days, the fever being continuous; he could not remember anything about a bubo. Shama was taken ill in the village and died in one day: no bubo noticed. Munga was ill for two days, had pain below the ear, but no swelling was noticed. Mohan Singh was taken ill two days after Manga; had continued fever for five or six days; no swelling noticed.

Witness II.—Magnamand, Patwari of Malla Kaliphat.

States that he visited the village with the Native Doctor, who told him that the disease was Gola Rog, he saw none of the cases, but believes that Munga was the only one who had a swelling. He did not hear of any dead rats, either in this or any of the neighbouring villages.

(4.) Chunni Village, Pargana Nagpur.

Evidence of villagers:—

Witness I.—Dhan, Rajput, aged 40.

He was the father of case 1, Janaki, and husband of case 2, Kodi. Janaki was taken ill first. She was ill for three or four days with continued fever. She had a swelling in the right arm-pit, which did not suppurate. The day after her death her mother, Kodi, became ill. The village was then evacuated, and Kodi was removed into the jungle. She died in five or six days. She had fever all the time, with a swelling on the right side of the neck. No one had purchased clothes, food, &c. from neighbouring villages, nor had any strangers visited the village. Two or three days before Janaki became ill a dead rat fell from the roof of his house. He also noticed a bad smell in the house. There are many monkeys around the village, but he saw neither sick nor dead ones.

Witness II.—Chatru, Rajput, aged 46.

He was the father of case 3, Silaku, and grandfather of case 4. Sialku was taken ill whilst the people were living in huts in the jungle. He was only ill for one day, with fever, constipation, and a swelling over the cheek. There is considerable intercourse between the villagers of Chunni and Sankari.

Witness III.—Shib Ram, Rajput, aged 40.

He was taken ill about a fortnight after the death of case 6 (Rupi, who died on January 19th, 1896). At that time he was living in the jungle, where he had been since November 1895. He had fever for three days, then a bubo appeared in the left groin, which suppurated for about 10 days. (There is now a depressed scar in the left groin.) He had, all the time, some cough. The treatment consisted of prayers. His wife and two children were living in the same hut, but were not attacked. Two months after the evacuation of the village (*i.e.*, about the beginning of January 1896), he saw smoke coming from the houses of Ganga (case 5) and Rupi (case 6), who died a few days afterwards. He saw a man who had returned to the village in January, and who left it again after the deaths of Ganga and Rupi; he was not attacked.

APPENDIX B.—(I.)

OUTBREAKS of MAHAMARI in GARHWAL.

Compiled from Patwaris' Reports.

Pargana.	Patti.	Village.	Year.
Badhan	Karakot	Kimoli	1874–75
		Mangoli	1874–75
		Bunga	1874–75
		Jhijoni	1874–75
	Pindarpur	Mudoli	1866
	Badhan	Talla Dhara	1871
		Gothinda	1875
		Bunga	1824
		Banga	1887
		Ratagaon	1876
		Ratagaon	1885
		Pharali	1859
		Pharali	1878
		Bursole	1871
		Korar	1859
		Badar	1871
		Kota	1840
		Kota	1846
		Silori	1865
		Athoo	1834
		Walgara	1824
		Dungari	1824
		Kanpurli	1824
		Gerurli	1824
	Badhan Walla and Talla.	Very severe over the whole pattis.	1850
Nagpur	Khaderh	Kharki	1876
		Khatrapal Warli.	1876
		Dungar	1876
	Bichla Nagpur	Pokhari	1876
	Talla Nagpur	Phalasi	1854
		Sori	1873
	Talla Kaliphat	Dhar	1878
		Mangu	1876
		Kalen	1877
		Tewari Sem	1877
		Kyaura Talla	1877
		Baramwari	1875
		Phegu	1875
		Bashti	—
		Biraun	1859
		Biraun	1876
		Sangurh	1876
		Rumsi	1876
		Kole	1876
	Malla Kaliphat	Dangwari	1859–75–95
		Chunni	1859–95
		Bhatwari	1859
		Sansari	1896
		Patali	1859
		Asma	1867
		Thaglasi	1867
		Guptakashi	1859
		Naia	1844
		Bhet	1850
		Kotyara	1850
		Dinsal	1841
		Dinsal	1859
		Dinsal	1876
		Dinsal	1887
		Rudrapur	1887
		Kunjeti	1853
		Ganwari Jal	1852
		Kabilta	1853
		Sankari	1853
		Sankari	1896
		Semi	1896
		Lamgoudi	1876
		Dungari	1877
		Thali	1853
		Thali	1896
		Andarwari	—
		Tulanga	1850
		Usara	1878
Dasouli	Malla Dasouli	Banjhagar Lasi.	1864
Chandpur	Chaprakot	Marwara	1850–57
		Bagwari	1878
		Randgaon	1860
	Chauthan	Dadoli Talli	1886
		Dadoli Malli	1886
		Ghunaria	1849
		Saunsal	1859
		Pulkalkote	1859
		Gairgaon	1859
		Daira	1859

Pargana.	Patti.	Village.	Year.
Chandpur -	Chauthan -	Jainte -	1859
		Gaunlun -	1859
		Manson -	1867
		Maikoli -	1867
		Kande - -	1859
		Bharuon -	1859
		Manyargaon	1859
		Basola - -	1859
	Dhaejyuli -	Gwetgaon -	1850
		Eda - -	1891
		Eda - -	1850
		Nangaon -	1850
		Nangaon -	1850
		Garioli - -	1894
		Salaney -	1885
		Tarpali -	1848
		Kundil -	1860
		Kucholi -	1865
		Dyulekh -	1871
		Rishti - -	1848
		Dungari Talli	1852
		Dungari Malli	1859
		Sont - -	1848
	Lohba - -	Marorha -	1853–54
		Parwari -	1853–54
		Sarkoti -	1853–54
		Ghandyal -	1853–54
		Rikholi -	1853–54
		Parkande Malli.	1853–54
		Pharkande Talli.	1853–54
		Matkote -	1853–54
		Payyana -	1853–54
		Dungari -	1853–54
		Ran - -	1853–54
	Bali - -	Dyulekh -	1850–51
	Khansar - -	Latugair -	1850
		Maikholi -	1850
	Malla Chandpur	Dhamkar -	1876
		Majyari -	1876
		Pidwala -	1852
		Malaya -	1852
		Mathar -	1852
		Barat - -	1852
Malla Salan	Dhondyalsyun Bangarsyun.	Khaitoli -	1851
		Meldhar -	1856
		Dunloti -	1856
		Tulyani -	1856
		Bhather -	1856
	Ajmere - -	Lakhwar -	1879
		Bhankihari -	1879
		Kather -	1879
		Harsu - -	1892
		Dhura -	1879
		Tunlwani -	1879
		Dewarana -	1879
Chandkot -	Mawlsyun -	Dharasu -	1860
		Baidul -	1860
		Musasu -	1860
	Jaitolsyun -	Pakahara -	1859
		Temkhandia	1859
		Bagwala -	1859
Dewalgarh -	Ghordorsyun	Pinani - -	1858
		Sewala -	1858
		Pipali - -	1858
		Markhola -	1860
		Pang - -	1860
	Ramgarh -	Siron - -	1858
		Sidran - -	1858
		Wagrasu -	1858
		Sarkhai -	1858
		Kharsai -	1858
		Bena - -	1865
	Bachansyun -	Dungra -	1859
	Kandarsyun -	Kanakote -	1859
		Sidang - -	1859
		Nangaon -	—
		Pajyana -	1859
		Syoli Malli -	1859
		Syoli Malli -	1878
		Syoli Talli -	1858
		Khand Malli	1858
		Khand Talli -	1853
		Tila - -	1856
		Jakh - -	1850
		Dala - -	1877
		Pali - -	1877

APPENDIX B. (II.)

OUTBREAKS of MAHAMARI in the ALMORA DISTRICT. Compiled from Patwaris' Reports.

Pargana.	Patti.	Village.	Year.
Danpur -	Nakuri - -	Barkuri -	1882
		Batla - -	1882
		Wadyara -	1882
		Kiroli - -	1882
		Raikhalgum -	1882
		Baruri - -	1882
		Surkali -	1887 and 1892
		Karai - -	1887
		Ghalai -	1877
	T. Danpur -	Gadera -	1877
		Pharsali -	1877
	M. Danpur -	Sumgar -	1877
		Kilhara -	1852
		Biddiyallot -	1852
		Nimik - -	1852
	B. Katyur -	Kausani -	1876
		Bhetu - -	1876
	M. Katyur -	Wajyulis -	1877
		Kajyuli -	1877
		Chhetic Pal -	1848
		Tailihat -	1877
		Baijnath -	1848
		Puiglan -	1852
		Maglta -	1877
	B. Danpur -	Liti - -	1875
		Maikori -	1875
		Bhandar -	1876
	Dug - -	Sentil - -	1876
Johar - -	Goriphat -	Boltri -	1876
Barahmandal	Athaguli -	Bhandargum	1877
		Dungora -	1876
		Balta - -	1876
		Bintola -	1887 and 1878
		Sisar - -	1877
	T. Syunari -	Nainoli -	1877
	M. Syunari -	Matyoli -	1876 and 1887
	Pirairan - -	Chbani -	1876
		Man - -	1876
		Tana - -	1876
	Kairairum -	Nalkot -	1877
Pali - -	Wallinaya -	Suriara -	1883
	Malludwara -	Kainla - -	1858
	Tulla Genious	Borsguin -	1885
Gangoli -	Pungran -	Lohathal -	1887
		Dasauli -	1887
Danpur	Nakuri - -	Suni - -	1893
		Majhera -	1893
Darma -	Chaudans -	Tanjago Molu	1858
		Genoite -	1858 and 1868
		New - -	1884
		Sankuri -	1883
		Sirkha -	1882
		Pinlo - -	1882
		Pali - -	1882
		Sirolong -	1882
		Challa - -	1882
		Rang - -	1882

APPENDIX C.

TRADE between KUMAUN and THIBET.

(By PANDIT RAGHUBAR DATT JOSHI, Deputy Collector, Garhwal).

The trade is carried on *viâ* the Mana, Niti, Milam, Darma, and Byans Passes by the Bhutias.

The method of trading was formerly entirely by barter; but, of late, cash payments have begun to come into use.

The season during which the trade is carried on lasts for about five months, from June to October, during which time alone the passes are open. The Mana traders go to Tholing; from Niti and Johar they go to Daba; and from Darma to Gyanima. Those who use the Byans pass trade with Taklakhal. Some of the larger traders of Mana, Niti, Johar, and Darma go to Gartok.

The exports from Kumaun consist of cloth (English and Country), grain of all kinds, metal vessels and iron, sugar, tobacco, dyes, and spices.

The imports are salt, ghee, borax, tea, wool, blankets, ponies, sheep, yaks' tails, and skins.

The Bhutias are not allowed to enter Thibet without permission from the Thibetan Authorities.

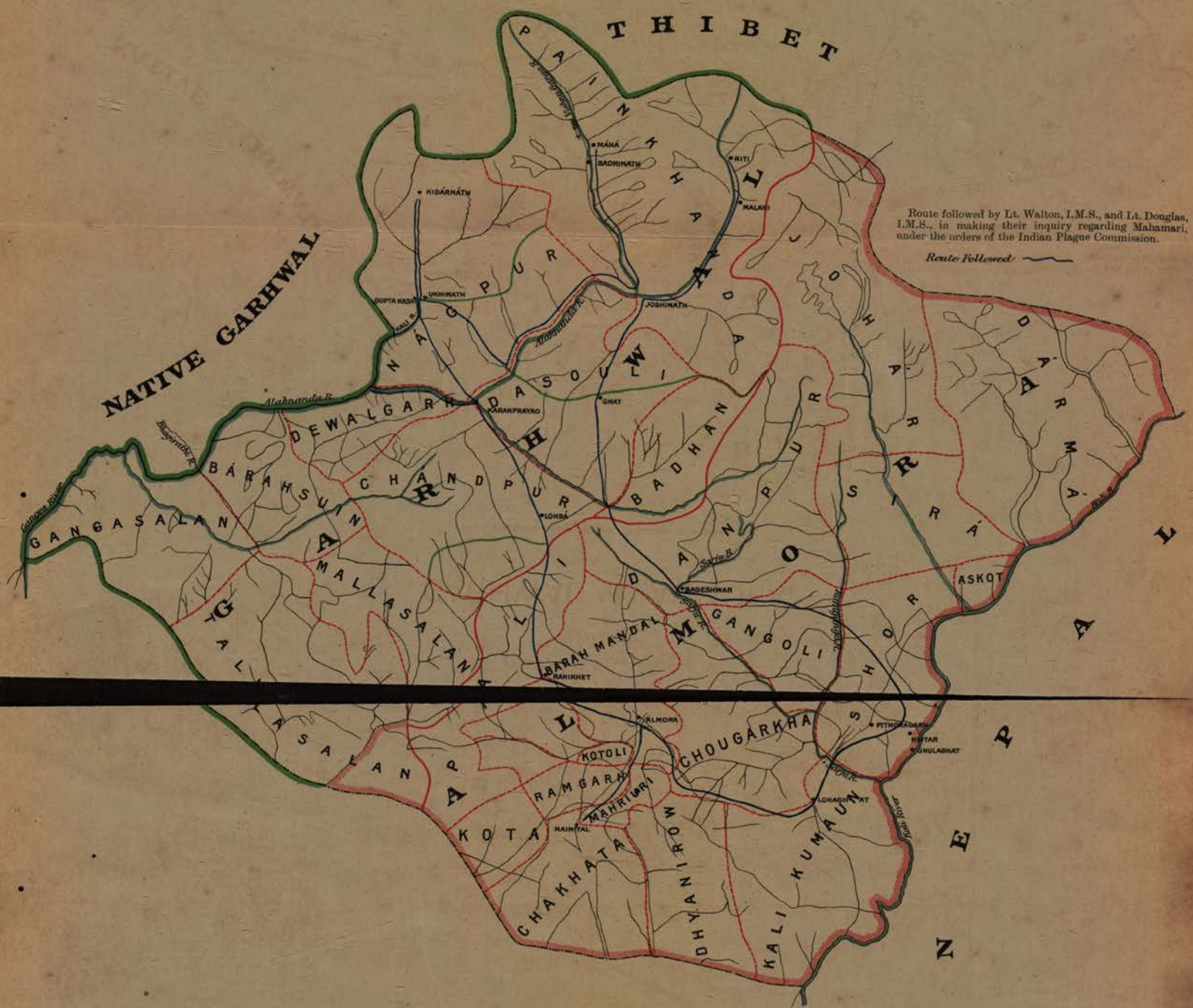
At the end of May, or at the beginning of June, the Jong Pens, or Thekadars (Thibetan Officers) send their agents to Kumaun. These men visit the Kumaun trading villages, and make inquiries about commercial matters, and also about the existence of any disease in Kumaun. They report to their masters the results of their inquiries. The Jong Pen then sends permission for the trading season to be opened. Certain conditions are imposed upon the Bhutias. Thus they bind themselves not to import any contagious disease, whether human or of cattle, nor to allow any British Officer to accompany them into Thibet without special permission. Sometimes a stone is broken into halves. The broken pieces are wrapped in cloths and sealed. Should there be any infringement of the conditions imposed, the Bhutias are required to pay a fine, equal in weight of gold to the broken stone. Written bonds are often used, these bonds appear to be renewed every year.

The Bhutias who trade with Thibet inhabit some 15 villages in the neighbourhood of Mana and Niti; others come from Johar, Milam, Darma, Byans, and from villages in Chandpur, Dhanpur, Goriphat, and Chaudans. The inhabitants of Nagpur, Desoli, and Badhan do not directly trade with Thibet, but through the medium of the Bhutias of other Parganas.

The Bhutias visit Thibet twice, or sometimes three times during the season. No women or children accompany them. The head of the family usually stays at the Thibetan market, while the other members pass to and fro between Thibet and Kumaun. The number of Bhutias entering Thibet is, on an average, about 1,500 persons.

At the end of the season the traders go down from the villages that they have occupied during the summer to other villages, situated farther south in Kumaun, such as Tapoban, Joshimath, and Karnprayag; while some of them remain at these places during the winter grazing their flocks, others wander from place to place with the goods they have accumulated, and visit cities in the plains, such as Meerut, Cawnpur and others. A few even go as far as Bombay and Calcutta to purchase cloth and other articles for the next season's trade.

MAP
OF
GARHWAL & ALMORA.



Route followed by Lt. Walton, I.M.S., and Lt. Douglas, I.M.S., in making their inquiry regarding Mahamari, under the orders of the Indian Plague Commission.

Route Followed ~~~

APPENDIX No. XXVI.

RULES FOR THE PREVENTION OF MAHAMARI IN KUMAUN, NORTH-WEST PROVINCES.

NOTICE.

The rules for the prevention of Mahamari, the observance of which entirely stamped out that terrible disease seem to be falling into neglect, and there is danger that the plague formerly so fatal to the district may again visit it, if the simple measures of cleanliness prescribed by Government are not observed.

Mahamari is caused by dirt and the object of the rules is to save the lives of the people by keeping villages clean.

Government has no wish to cause inconvenience to the people, but it cannot allow them to sacrifice their own lives and those of their neighbours because they will not observe simple precautions for their own benefit. The Mahamari rules are therefore republished for general information that all may know what is required of them.

It must be distinctly understood that failure to carry out the rules now that they have been repeatedly published will lead to the punishment of those who are so little alive to their own interests as to neglect them, and an answer will be required not only from those who keep their houses in a filthy condition, but also from Patwaris, Thokdárs and Padháns who are appointed to positions of influence to assist the Government in taking measures for the good of the people. Patwaris, Thokdárs and Padháns are therefore responsible for seeing that the rules are carried out in their Pattis and villages, and if they fail to insist on their observance and to promptly report neglect of them they will be held unfit for their posts.

MAHAMARI RULES.

Kumaun Division.

1. All cattle, goats, and sheep to be housed in sheds not less than 50 kadams or 100 feet away from the village. These sheds should be located below the village if possible, if not either to the right or to the left of it.

2. Every room in each house to have a window, 2 feet by 2 feet opening, on the outer wall of the house, in the wall opposite to the doorway for purposes of ventilation.

3. Where there is more than one room in a house the inhabitants should distribute themselves between the different rooms at night so far as possible to diminish the number sleeping in each room.

4. No one should perform the offices of nature within 200 yards of a village.

5. Rank vegetation should be cut down among and around the houses.

6. The springs used for drinking water should be kept clean; washing clothes and watering cattle, performing the offices of nature, &c., should be done below the spring head.

7. Manure heaps must not be collected within 50 kadams or 100 feet of houses and always below them, so that in the rains the drainage from the heaps may run away from the houses.

8. When the rats begin to die in any observable numbers the inhabitants are *at once* to vacate the village; building sheds (open on two sides) for themselves at a not less distance than half a mile from the village; living apart from each other in separate families; the families not to return to inhabit the village for a whole month, having previously thoroughly cleaned the whole village, leeped, ventilated, limewashed, and fumigated with sulphur each room of every house.

9. If Mahamari breaks out in a village, the inhabitants must immediately vacate it, and not venture to inhabit it until there has been no case of the disease amongst them for two whole months. Previous to returning to inhabit the village, it must be cleaned, leeped, ventilated, limewashed, and fumigated with sulphur.

10. The bodies, bedding, and clothing of persons who had died of Mahamari must be at once burnt; care being taken that sufficient wood is used, provided if need be by the Padhán, to ensure the reduction of the body to ashes.

11. All houses in which a death from Mahamari has occurred must be burnt, together with any article likely to retain infection.

12. Whenever Mahamari appears information should be at once given by the Padhán to the Patwari who will send a report to the Deputy Commissioner, and a copy of it to the Sub-Divisional Officer.

J. V. STURT,
Offg. Deputy Commr., Almora District.

Almora, Dated 1st August, 1894.

APPENDIX No. XXVII.

NOTE ON THE SANITARY BOARD

OF THE

NORTH-WEST PROVINCES AND OUDH.

The Sanitary Board of the North-West Provinces and Oudh was appointed in 1889 under G. O. No. 27/V–10B, dated 9th February 1889. Its procedure was laid down in G. O. No. 42/V–10B of 6th March 1890, under which it was tentatively constituted as a consultative, and not as an executive body. Both these orders are printed in the Annual Sanitary Report for 1889 as Appendix A. to the Report.

The Board was charged with the duty of instituting a sanitary survey of the Province, and especially of ascertaining the localities in which the presence of canals or railway systems made large schemes of drainage necessary. It was required to report on the best methods of introducing sanitary reforms in rural areas, and it was made the referee and adviser of Government on all questions especially remitted to it for opinion by the Government, the Sanitary Commissioner, or Commissioners of Divisions.

It consisted of the following members:—

The two Secretaries to Government in the Public Works Department, the senior Secretary being President of the Board.

The Secretary to Government in charge of the Municipal and Local-Self-Government Department.

The Inspector-General of Civil Hospitals, North-West Provinces and Oudh.

The Sanitary Commissioner, North-West Provinces and Oudh.

The Legal Remembrancer to Government, North-West Provinces and Oudh.

The Director of Land Records and Agriculture, North-West Provinces and Oudh.

The Commissioner of each Division was made ex-officio a member of the Board, and two native gentlemen were required to be nominated by the Commissioner when necessary. The President was given authority to invite, to be additional members of the Board, for the purpose of a particular meeting, any of the following persons:—

(1.) District Magistrate.
(2.) Civil Surgeons.
(3.) Military Officers, with the permission of the General Commanding the Division.
(4.) Unofficial Europeans.

In 1893 the Sanitary Engineer was made Secretary to the Board and its adviser on technical matters. The Legal Remembrancer and the Director of Land Records were relieved of their duties as members.

In 1896 an important change was made both as regards the constitution and the functions of the Board. Under G. O. No. 268/XVI.–461B. 8, dated 16th September 1896, it was entrusted with duties of an executive nature, and it now consists of the following members:—

Permanent:—

(1.) Inspector-General of Civil Hospitals, President.
(2.) One of the two Secretaries in the Public Works Department.
(3.) Sanitary Commissioner.
(4.) Sanitary Engineer, Secretary.

Additional:—

(1.) Commissioner of the Division in which the sitting of the Board takes place.
(2.) The District Magistrate, (3.) Civil Surgeon, (4.) District Engineer, (5.) A delegate from the District Board, } of the district whose sanitary business is being considered at the time.

When the sanitary business of a Municipality is under consideration a delegate from the Municipal Board and the Municipal Engineer (if any) take the place of the District Board's delegate and District Engineer.

The functions of the newly constituted Board are:—

Advising the Commissioners of Divisions as to whether administrative sanction should be given or withheld when projects of a sanitary character are submitted to them by Municipal Boards for sanction.

Giving administrative sanction to all sanitary work undertaken by District Boards towards the cost of which it may contribute from funds placed by Government at its disposal for this purpose.

Advising the Commissioners of Divisions as to giving or withholding administrative sanction to all other projects of a sanitary nature proposed to be executed out of the District Board funds alone when the estimated cost exceeds Rs.1,000, and does not exceed Rs.10,000.

Promotion of rural sanitation, by such measures as construction and repair of wells and tanks for drinking water and the drainage of the village site, &c., by (1) granting aids to the District Boards from funds placed by Government at the Board's disposal for improvements which require expenditure of money and (2) examining the rules, &c. made by the chief sanitary officer of the district, and suggesting such improvements as experience may dictate.

Promotion of sanitation in Municipalities without any contribution from the funds placed at the Board's disposal.

The following rules regulating the procedure of the Board have been issued by the Government:—

At the commencement of each year the permanent section of the Board shall draw up a programme for the year fixing the date and places of meeting and notifying any important subjects which may be for consideration in each division. References from Government in local sanitary matters will be considered at these meetings, and plans adopted. In addition to such meetings as may be needed for the despatch of ordinary business the Board shall sit once a year in each revenue division, and, when sitting in a division, shall have additional members enumerated above.

The Board shall keep minutes of their proceedings, which will form the basis of a chapter in the Sanitary Commissioner's Report.

Among the more important matters considered and advised upon by the Board were:—

In 1889 the Board prepared the draft of an Act for the enforcement of sanitary regulations, the provision of a water supply, and the maintenance of a simple system of conservancy, in rural areas. It drew up instructions for obtaining precise information as to the sanitary condition of all Municipalities with a population of 10,000 and upwards, and on all areas injuriously affected by canals, railways, and other public works. It further prepared rules for determining the relation in which it should stand to the Government and the Sanitary Commissioner on the one hand, and to the local authorities and the Public Works Department on the other.

A sub-committee was appointed to consider the system of mortuary registration and to devise measures for its improvement.

The Inspector-General of Civil Hospitals was requested to compile a manual for the use of Civil Surgeons in medical charge of districts bringing together the various orders which define their position and duties in sanitary matters.

Rules determining the relations of the Sanitary Commissioner with District Officers and Local Boards were drafted and submitted to Government. These were approved and circulated to all officers concerned.

1890.—The special reports on the sanitary condition of Municipalities which the Board had called for were considered, a preliminary abstract made and published in the Annual Report of the Sanitary Commissioner for the year 1889, and the attention of local authorities drawn to the defects thus brought to notice. The district reports of specially insalubrious tracts were examined at successive meetings, and submitted to Government with a memorandum on each revenue division, in which the localities requiring drainage were specified, and the adequacy or otherwise of the remedial measures already taken or in progress, stated. The question of improving the registration of mortuary and vital statistics in rural areas and in Municipalities was dealt with in Committee, and recommendations for its improvement submitted to the Government. These in the main were accepted. The pollution of rivers by the discharge of town sewage was also considered by the Board at the direction of Government, with special reference to the objection which had been taken in several quarters to the water-supply and sewage project for the city of Benares. After careful consideration of the subject, the Board submitted to Government a scheme for observing the volume of sewage discharged into the Ganges, Jumna, and Gumti, by the largest towns on their banks, and for securing a proper analysis of the water of these rivers.

The supplementary or provincial tables of the Census of 1891 were, under instructions from the Government, examined, and suggestions made to Government for their amendment in certain respects. Measures for providing Municipal authorities with standard plans and estimates for latrines, slaughter-houses, and other sanitary appliances were discussed; and steps taken to prepare a scale of conservancy establishments, in proportion to population and sanitary requirements suitable for Municipal areas. The reports of the special committees appointed by Government to examine the sanitary state of the two Hill Municipalities of Naini Tal and Mussoorie, where cholera, in an epidemic form, had prevailed for some months, were considered. The recommendations of the Board on these reports were duly submitted to the Government and were acted upon.

1891.—A letter from the Sanitary Commissioner on the measures taken by the Magistrate of the Basti district to promote vaccination by means of voluntary and unpaid vaccinators was read and submitted to Government with suggestions.

The Sanitary Commissioner's recommendation that a minimum and maximum scale of conservancy establishment for Municipalities should be laid down, was discussed, and he was asked to revise his proposals in communication with the Municipal Department.

Minor matters of a sanitary nature were also considered and discussed.

The question of the preparation of standard plans for latrines, slaughter-houses and other sanitary requisites was also considered.

1892.—The provisions of the Village Sanitation Bill were discussed at the first meeting held by the Board in 1892, and a number of suggestions for the revision of the original draft were communicated to the Government.

Much of the time of the Board was occupied by the question of improving the drainage of fever-stricken and water-logged localities.

An important reference was made, by Government to the Board, regarding the provisions that should be made to avert the danger that may arise from the throwing of dead bodies into streams during cholera epidemics. Suggestions were made and adopted by Government.

The recommendations of the Board in regard to the improvement of the registration of vital statistics had been considered by Government, and in most cases orders to give effect to the Board's proposals were issued.

Reports received from the Chief Engineer regarding measures taken to remove obstruction to drainage in certain villages in the Cawnpore district, and in villages adjoining the Oudh and Rohilkhand Railway, were placed before the Board and discussed.

1893.—In March 1893, the Board was asked to frame rules for the working of the North-Western Provinces and Oudh Village Sanitation Act (II. of 1892). These rules were discussed at several meetings, and a draft set of rules was finally approved by the Board. In forwarding the draft rules for the approval of Government, it was recommended that the extension of Part I. of the Act should be applied in the first instance to the districts of Allahabad, Azamgarh, Etah, Fyzabad, Gonda and Meerut.

The standard scale of establishment and appliances proposed by the Sanitary Commissioner was approved by the Board and its gradual adoption recommended to the Government.

The question of the sale of quinine at a cheap rate through village post-masters was laid before the Board and discussed.

Papers regarding the insanitary state of Baraut, in the Meerut district, were laid before the Board, and certain suggestions made regarding filling up of jhils round the the town, and enforcing the proposals made by the Civil Surgeon in his note on the health of Baraut.

Certain cases of obstruction of drainage in the Muzaffarnagar, Pilibhit, and Bareilly district were considered and suggestions made.

A note by the Sanitary Commissioner on the construction of sanitary wells with pumps, &c. attached, was discussed, and certain suggestions made.

1894.—The draft rules under the Village Sanitation Act were again discussed, and, after amendment, submitted to the Government.

The next question of importance dealt with was the practice which prevailed in Oudh of first burying and subsequently exhuming and burning corpses of persons who had died of cholera. After considering the replies from the different District Officers and influential native gentlemen who were consulted in the matter, the Board arrived at the conclusion that the practice should be absolutely prohibited, and that this could be done without in any way interfering with the customs and religious feelings of the people.

Several reports on the measures taken to remedy obstruction to drainage in the canal districts were received and discussed by the Board.

A memorandum, prepared by the Sanitary Commissioner, expaining the existing system of registration of vital statistics was forwarded to the Government, with suggestions as to further improvements in the system.

The question of closing all public and private burial grounds within Municipal limits was discussed, and recommendations made to Government as to the restrictions which should be placed on such proceedings.

The Government order calling for a report on the best method of maintaining village sanitary records was considered. The Sanitary Commissioner was asked to prepare a note.

The more pressing drainage works required in the Meerut and Agra Divisions were considered, and the Irrigation Department asked to prepare a list for submission to Government.

The question of providing a supply of pure water for the use of pilgrims during the "Magh Mela" at Allahabad was discussed, and the Board expressed the opinion that the water supply system should be permanently extended to the outlying muhalla of Daraganj, and the pipe line utilised during fair times by having connexions made to standposts temporarily erected at the most crowded centres.

The proposal made by the Government of India that statements should be included in the Sanitary Commissioner's Report, showing the mortuary and meteorological statistics of selected districts together with the prices current of the chief food grains for the year under report and the previous five years, was considered, and suggestions made.

1896.—The final draft of the letter to Government, embodying the Board's opinion on the best method of maintaining village sanitary records was approved.

Two important cases of abnormally heavy mortality in the minor Municipalities of Baghpat in the Meerut district, and Deoband in the Saharanpur district, were referred by Government for investigation as to influencing causes, and for the Board's proposals for ameliorating the insanitary conditions prevailing. The Board deputed the Sanitary Commissioner and the Sanitary Engineer to make personal investigations on the spot.

The question of additional clerical assistance to Civil Surgeons for purposes of the re-organised and extended arrangements for mortuary and birth registration was discussed, and suggestions made to Government.

The letters to Government from the Chemical Examiner and Government Bacteriologist, advising that the chemical analyses of water from Municipal supplies should be discontinued in favour of bacteriological analyses alone, were considered. The view taken by the Board was that chemical analysis had its

uses, and was just as valuable as the bacteriological tests for the purposes for which they were employed, and that they considered both tests should be retained.

A note by the Sanitary Engineer on the subject of supply of water from wells and the improvement of the surroundings, for the better protection from contamination, was laid before the Board. It also described what had so far been done in the way of advances for repairs and improvements to wells.

1897.—The Board was consulted on certain matters in connection with the appointment of Sanitary Assistants and recommended in place of having one Assistant Surgeon posted as "Sanitary Assistants" to each of the three Hill districts, that for the present, only one Sanitary Assistant be appointed for the three districts with headquarters at Dehra Dun; and that an Assistant Surgeon be also posted to Basti and one to Azamgarh on account of the prevalence of epidemic diseases in these districts. This meant ten Assistant Surgeons being appointed to 12 districts.

The question of appointment of Hospital Assistants as Sanitary Assistants in the 36 districts where Assistant Surgeons are not at present appointed, was also considered by the Board.

The Board also expressed the opinion that a Lectureship in Hygiene at the Agra Medical School should be established.

A memorandum drawn up by the Sanitary Commissioner, on the subject of the disposal of night-soil in Municipalities, was approved by the Board and circulated for the guidance of Municipal Committees.

The joint report by the Sanitary Commissioner and the Sanitary Engineer, on the probable cause of the high mortality in the town of Baghpat, was placed before the Board and approved by it.

The Commissioner and Magistrate of Meerut were consulted in regard to the remedial measures proposed.

The high rate of mortality in the town of Deoband, Saharanpur district, was also the subject of investigation by the Board. The town had been inspected and reported upon by the Sanitary Commissioner and Sanitary Engineer. The unhealthiness of the town was attributed entirely to inefficient drainage. As the obstruction to drainage is due to the want of a proper outfall under the North-Western Railway, the Board put itself into communication with the railway authorities on the subject.

The question of appointing a special officer with mechanical engineering training and experience, to supervise the working of the pumping machinery at the various waterworks in these Provinces, was considered by the Board, and referred to the various Municipal Boards to ascertain whether they would be willing to contribute towards his pay.

It was recommended by the Board that each Civil Surgeon be provided with a large scale map of his district, for the purpose of marking registration subcircles.

The Sanitary Commissioner's memorandum, together with a statement by the Inspector-General of Civil Hospitals, on the subject of extra clerks required for the offices of Civil Surgeons, was considered, approved, and submitted to Government.

1898.—The report by the Sanitary Engineer on the quality of the water supplied by the various Municipal waterworks in these Provinces during 1896–97 and 1897–98, was considered by the Board. A note by the Secretary, showing the reduction in the amount of organic matter effected by filtration at each of the waterworks, was also read.

A letter from the Commissioner of the Meerut Division, forwarding the District Magistrate's report on the sanitary condition of the town of Baghpat, was considered by the Board. The Board was glad to observe that any spare funds at the disposal of the Municipality would be expended in drainage and improving the sanitary condition of the town.

The Deputy Sanitary Commissioner's Report, and other papers, regarding the insanitary condition of the town of Kosi, in the Muttra district, were laid before the Board.

Papers regarding clerical assistance to Civil Surgeons were again laid before the Board. It was resolved that the Government be asked to sanction the appointment of an extra clerk to the Civil Surgeons of six selected districts where the assistance was most urgently required.

The report by the Sanitary Engineer to Government on the water-supply scheme for Jhansi, was discussed by the Board. It was considered by the Board that in the present financial position of the Municipality, the scheme by which it is proposed to pump water from the existing cluster of wells offers the most feasible and satisfactory means of providing a safe and satisfactory supply of water to the residents of the city of Jhansi.

General.—The Sanitary Commissioner's Annual Report was considered by the Board each year, and many other minor matters discussed.

The following is a List of the important Waterworks carried out in Towns of the North-West Provinces and Oudh from 1889 to 1898: viz.—

Name of Town.	Date of Completion.
Agra - - -	3rd December, 1890.
Allahabad - -	26th March, 1891.
Haldwani - - -	20th June, 1891.
Naini Tal - -	October, 1892.
Benares - -	18th November, 1892.
Cawnpore - - -	17th March, 1894.
Lucknow - -	21st July, 1894.
Mussoorie - -	15th April, 1895.
Dehra Dun - - -	12th March, 1896.
Meerut - - -	6th May, 1896.

The above are all very important works for supplying the cities and town mentioned, with a pure filtered water-supply.

At Benares, in addition to the water supply scheme, an extensive sewerage and drainage project has been initiated, and is now in progress.

Large sums of money have been expended in certain towns, especially in Agra, in remodelling and extending existing drains, paving streets, &c.

In Cawnpore, the Sadr Bazar has been paved and drained at a large cost.

At Mussoorie, a scheme has been recently completed by which the sewage of the settlement is conveyed away from the inhabited site by means of a sewage shoot.

Many new slaughter-houses have been built, some of which, as at Allahabad, are very fine structures.

A good deal of money has also been spent in filling up tanks and water holes, containing stagnant water, in and about inhabited sites.

Numerous latrines, urinals, dust-bins, &c., have been erected in the various towns and cities, and the service for the removal of night-soil, rubbish, &c., much enlarged and improved.

SAML. J. THOMSON,
C. I. E.
Sanitary Commissioner,
North-West Province and Oudh.

MAP OF HARDWAR.

NORTH WESTERN PROVINCES.

REFERENCES.

Area evacuated shown by a Green Line.

PLAGUE CASES OUTSIDE THE AFFECTED AREA.

Nos.	NAME OF PERSON.	DATE OF OCCURRENCE.	Nos.	NAME OF PERSON.	DATE OF OCCURRENCE.
I.	Asa Ram . . .	22nd April	VIII.	Jammu . . . . . (died with symptoms of pleurisy—a doubtful case of plague.)	30th May
II.	Kishan Ram . . .	15th May			
III.	Musst. Saiji . . .	17th May			
IV.	Saudagar	18th May			
V.	Shama	27th May			
VI.	Bhinga	27th May	IX.	Uggar, Sadhu . . . . (found on Jawalapur road; had slept some nights at Gokal's house near Gaoghat.)	1st June
VII.	* Turi Ram . . .	27th May			

* This man was found lying in the open in Lakla Raod—he had not occupied any house. Not shown in this Map.

Y. 4174

Eyre, & Spottiswoode, Lith. London.

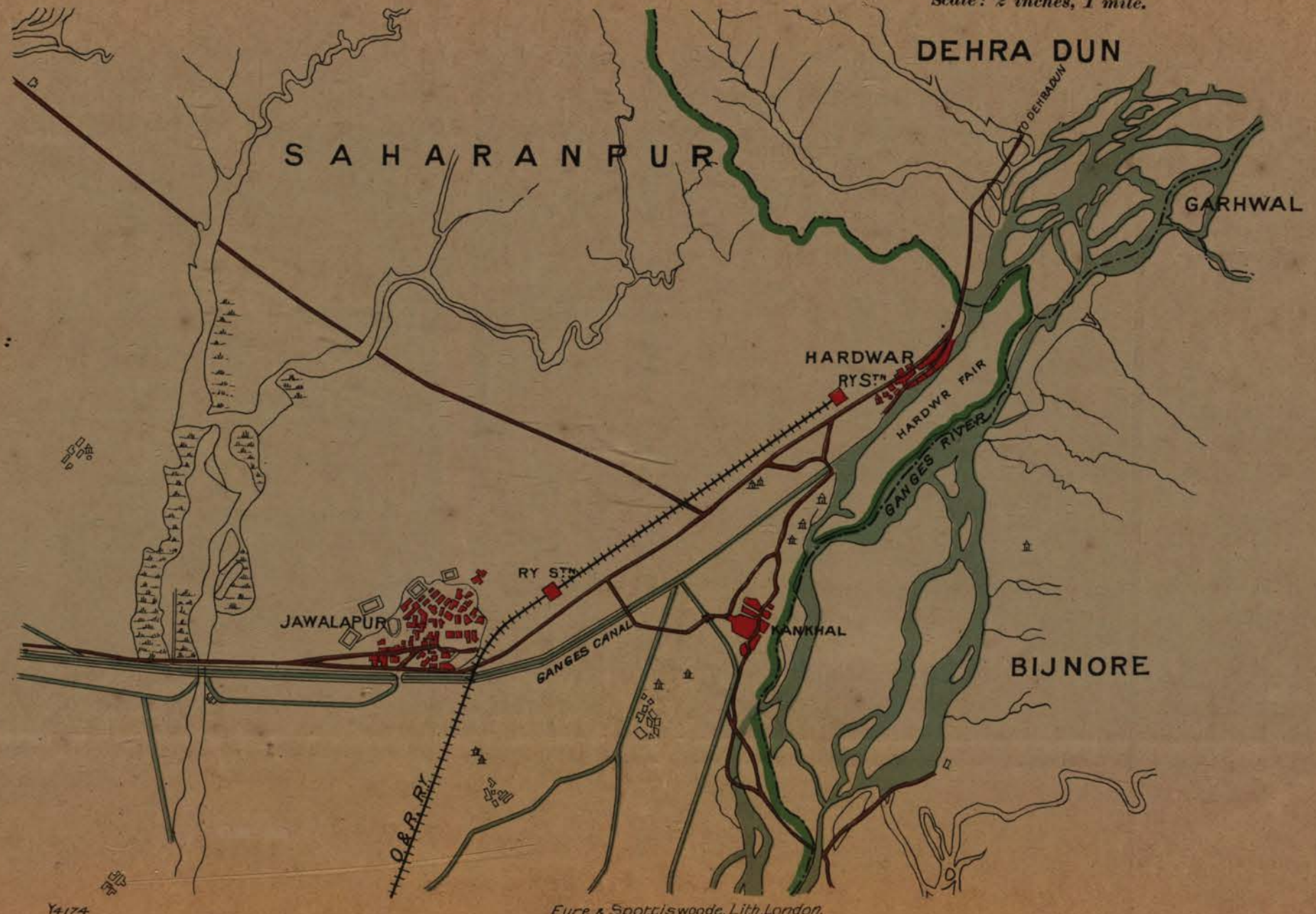
APPENDIX No. XXIX. (*See* Question No. 9212.)

MAP OF

HARDWAR and NEIGHBOURHOOD.

NORTH WEST PROVINCES.

Scale: 2 inches, 1 mile.



Y4174

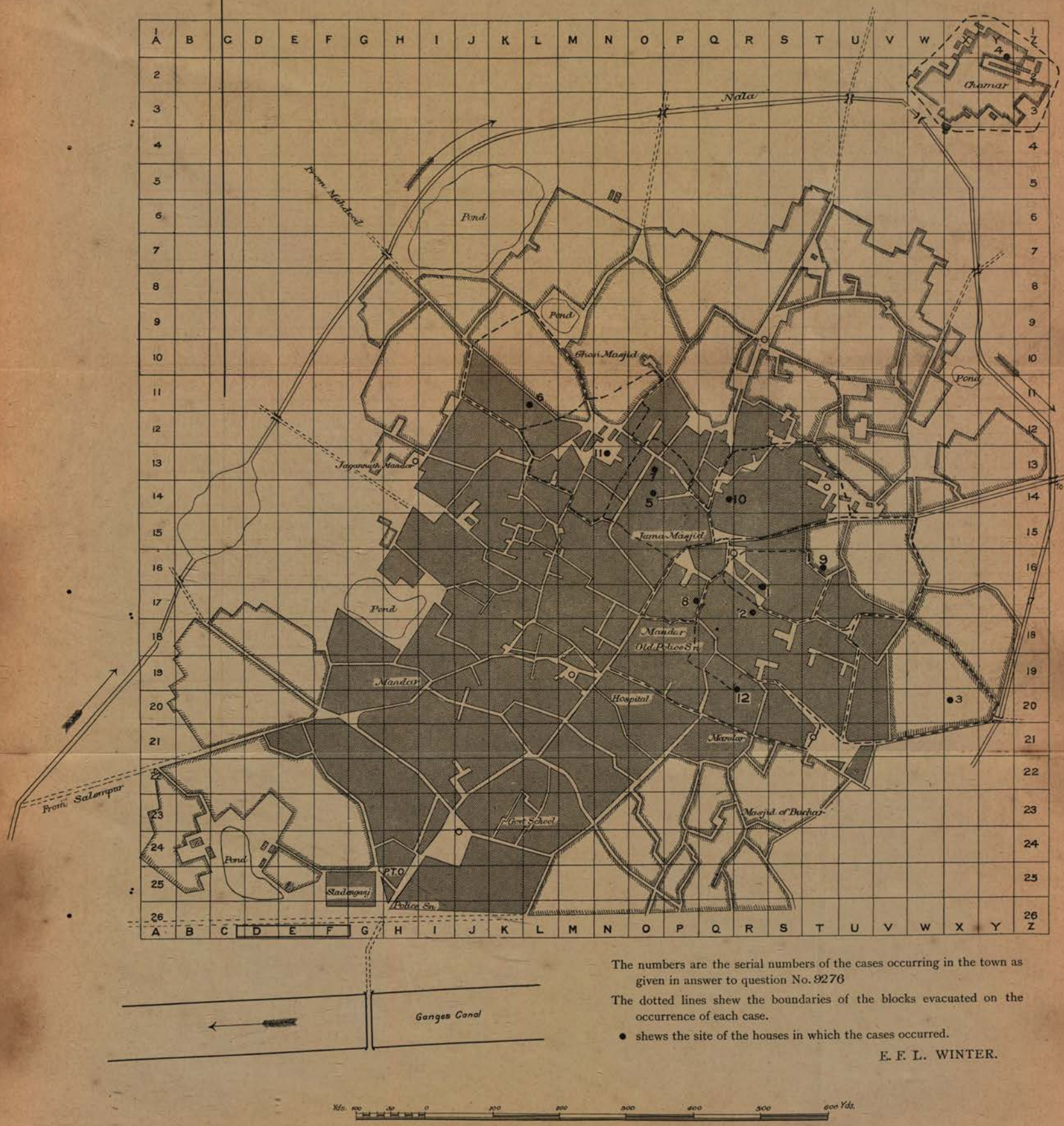
Eyre & Spottiswoode, Lith. London.

APPENDIX No. XXIX.

SKETCH OF JAWALAPUR.

NORTH WESTERN PROVINCES

Shewing spread of Plague.



The numbers are the serial numbers of the cases occurring in the town as given in answer to question No. 9276

The dotted lines shew the boundaries of the blocks evacuated on the occurrence of each case.

● shews the site of the houses in which the cases occurred.

E. F. L. WINTER.

Y4174

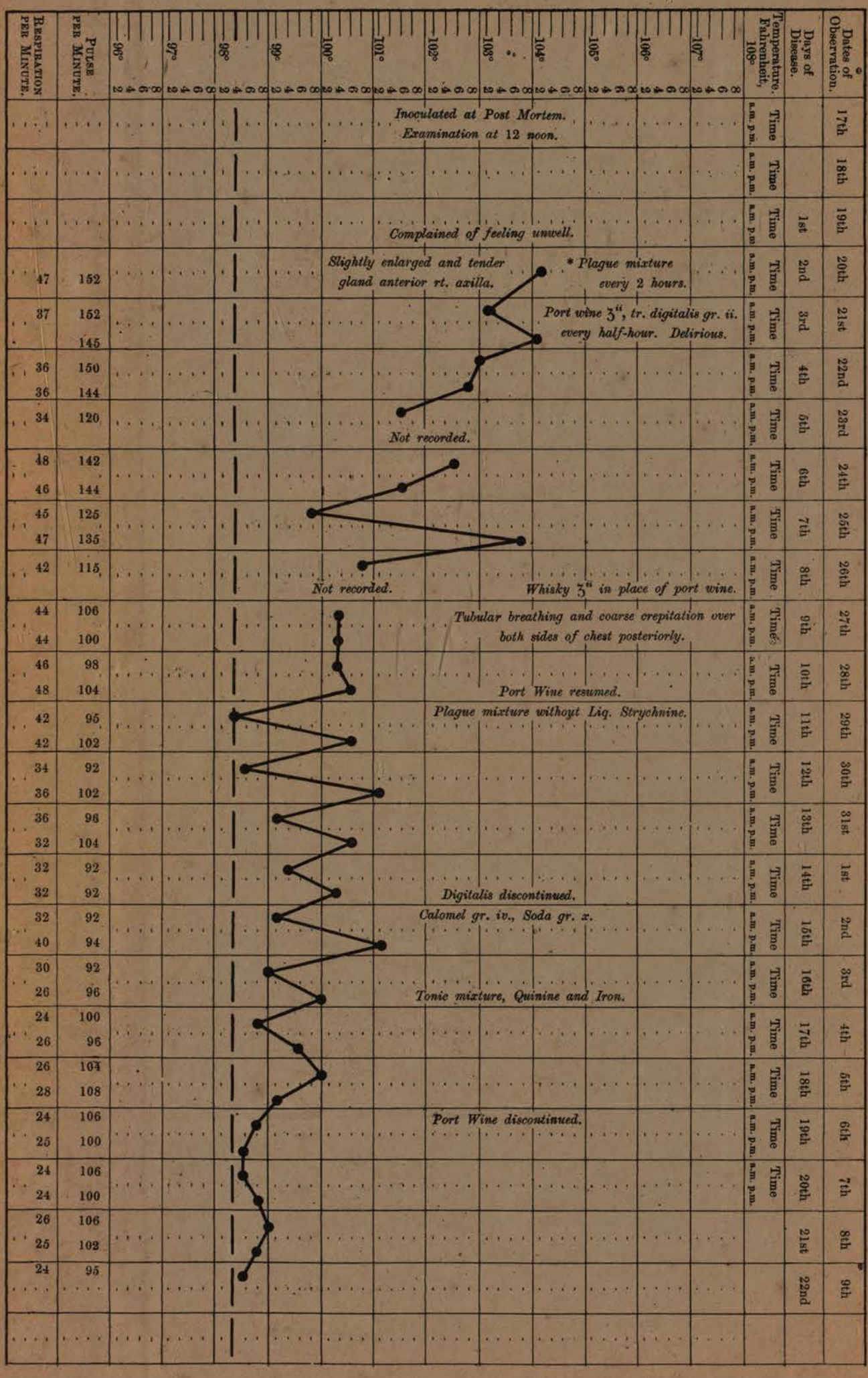
DEHRA DUN SADR DISPENSARY.

RECORD OF TEMPERATURE, PULSE, AND RESPIRATION.

APPENDIX, No. XXXI.

(*See* Question, No. 9566.)

Name—IBRAR HUSAIN. *Age*—30 Years. *Disease*—PLAGUE (inoculated).



Dates of Observation.	Days of Disease.	Temperature. Fahrenheit, 108°	Pulse per Minute.	Respiration per Minute.
17th		Time a.m. p.m.		
18th		Time a.m. p.m.		
19th	1st	Time a.m. p.m.		
20th	2nd	Time a.m. p.m.	152	47
21st	3rd	Time a.m. p.m.	152 145	37
22nd	4th	Time a.m. p.m.	150 144	36 36
23rd	5th	Time a.m. p.m.	120	34
24th	6th	Time a.m. p.m.	142 144	48 46
25th	7th	Time a.m. p.m.	125 135	45 47
26th	8th	Time a.m. p.m.	115	42
27th	9th	Time a.m. p.m.	106 100	44 44
28th	10th	Time a.m. p.m.	98 104	46 48
29th	11th	Time a.m. p.m.	95 102	42 42
30th	12th	Time a.m. p.m.	92 102	34 36
31st	13th	Time a.m. p.m.	96 104	36 32
1st	14th	Time a.m. p.m.	92 92	32 32
2nd	15th	Time a.m. p.m.	92 94	32 40
3rd	16th	Time a.m. p.m.	92 96	30 26
4th	17th	Time a.m. p.m.	100 96	24 26
5th	18th	Time a.m. p.m.	104 108	26 28
6th	19th	Time a.m. p.m.	106 100	24 25
7th	20th	Time a.m. p.m.	106 100	24 24
8th	21st		106 102	26 25
9th	22nd		95	24

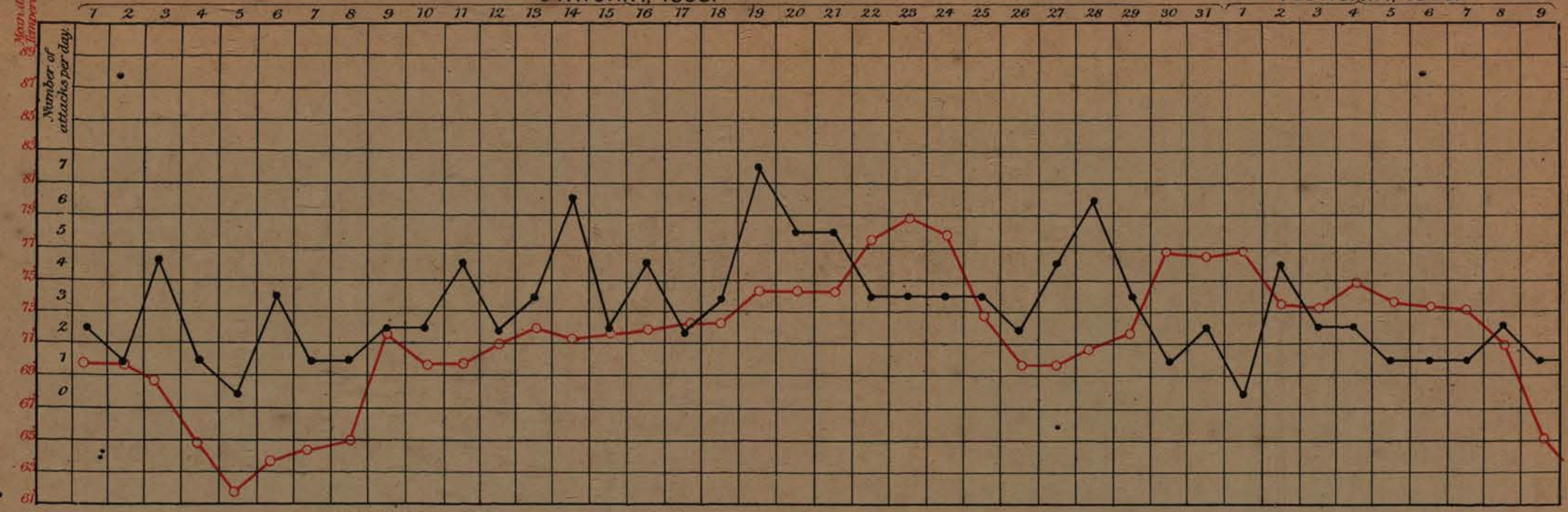
* Containing strychnine, digitalis, and carbolic acid (gr. i.) in each dose.

Food:—JUGGED CHICKEN, SOUP, and MILK alternately every hour.

Y. 4174.

APPENDIX, No. XXXI.

SHOWING (IN BLACK) THE COMBINED DAILY ATTACKS, AND (IN RED) THE MEAN DAILY TEMPERATURE IN THE TOWN OF SIROHI.



APPENDIX No. XXXII.

Y 4174

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MAP OF THE PLAGUE INFECTED AREA IN THE JULLUNDUR & HOSHIARPUR DISTRICTS

MAP No. 1.

SHEWING VILLAGES UNDER TREATMENT ON JANUARY 1ST 1898.

Scale, 2 Miles = 1 Inch.

REFERENCES

Plague Infected Villages ..... Red.

Villages in which Disease is Extinct, Blue.

Plague Officers Camp. ⊕

PHUGWARA

BANGA

GUNACHAUR

NAWASHAHAR

KULAITAH

UPRAH

MORAN

LISARA

PHILOUR

RAHON

GARSHANKAR

THE SUTLEJ RIVER

THE RIVER SUTLEJ

BAARI DOAB

BIST DOAB

SHAHPUR

JULLUNDUR

HOSHIARPUR

LUDHIANA

Ferry

Ferry

Ferry

MAP OF THE PLAGUE INFECTED AREA IN THE JULLUNDUR & HOSHIARPUR DISTRICTS

MAP No 2.

SHEWING VILLAGES UNDER TREATMENT ON FEBRUARY 1ST 1898.

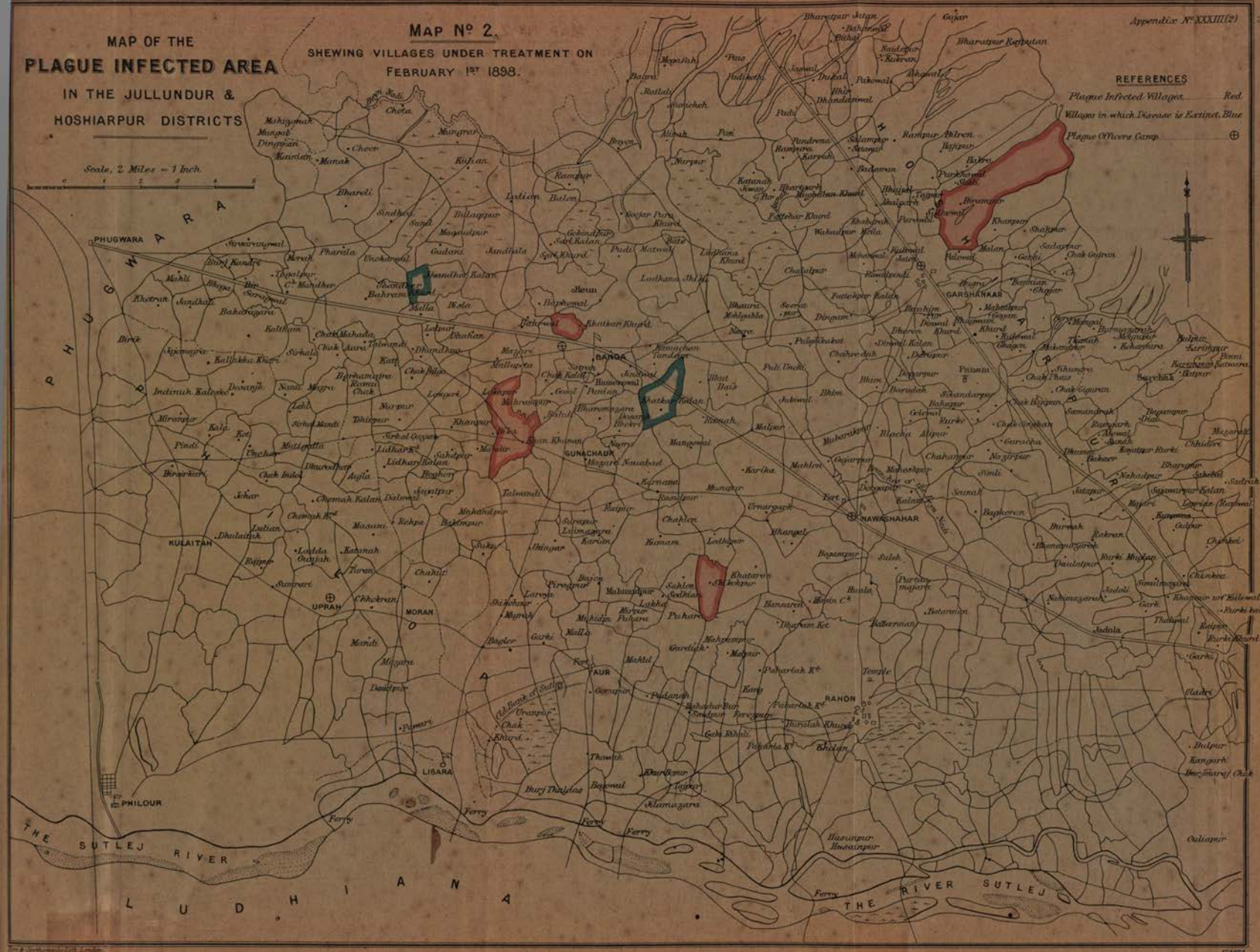
Scale, 2 Miles = 1 Inch.

REFERENCES

Plague Infected Villages ..... Red.

Villages in which Disease is Extinct. Blue

Plague Officers Camp ⊕



MAP OF THE PLAGUE INFECTED AREA IN THE JULLUNDUR & HOSHIARPUR DISTRICTS

MAP No. 3.

SHEWING VILLAGES UNDER TREATMENT ON MARCH 1ST 1898.

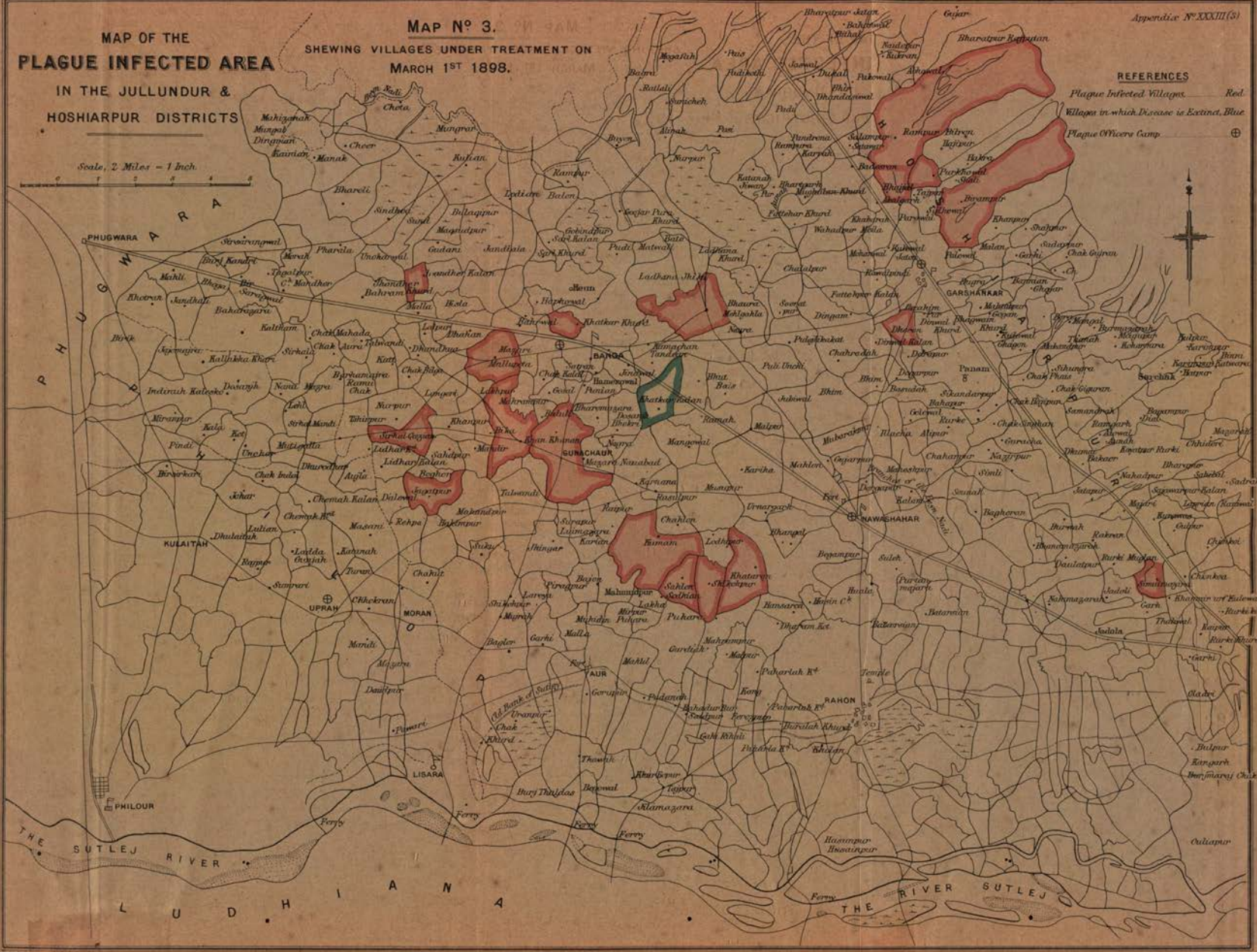
Scale, 2 Miles = 1 Inch.

REFERENCES

Plague Infected Villages ..... Red.

Villages in which Disease is Extinct, Blue.

Plague Officers Camp ..... ⊕



MAP OF THE PLAGUE INFECTED AREA IN THE JULLUNDUR & HOSHIARPUR DISTRICTS

MAP No 4.

SHEWING VILLAGES UNDER TREATMENT ON APRIL 1ST 1898.

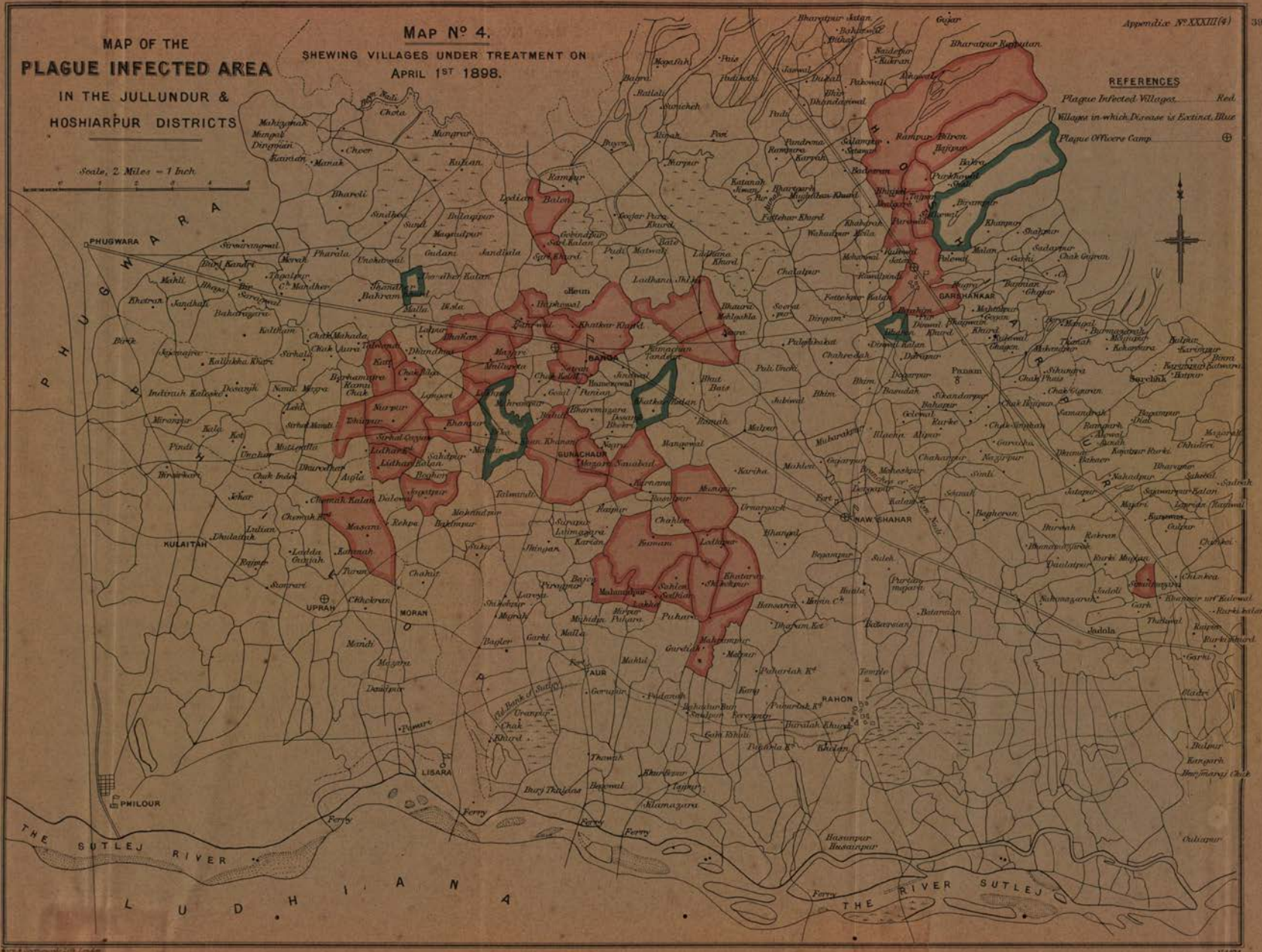
Scale, 2 Miles = 1 Inch.

REFERENCES

Plague Infected Villages ..... Red.

Villages in which Disease is Extinct, Blue

Plague Officers Camp ⊕



MAP OF THE PLAGUE INFECTED AREA IN THE JULLUNDUR & HOSHIARPUR DISTRICTS

MAP No. 5.

SHEWING VILLAGES UNDER TREATMENT ON MAY 1ST 1898.

Scale, 2 Miles = 1 Inch.

REFERENCES

Plague Infected Villages..... Red.

Villages in which Disease is Extinct, Blue.

Plague Officers Camp. ⊕

PHUGWARA

BANGA

GARSHANKAR

NAWAGHAHAR

SUNACHAUK

KULAITAH

UPRAH

MORAN

LAUR

RAHON

LISARA

PHILOUR

THE SUTLEJ RIVER

THE RIVER SUTLEJ

LUDHIANA

Byrne & Co. Photo-Litho London.

MAP OF THE PLAGUE INFECTED AREA IN THE JULLUNDUR & HOSHIARPUR DISTRICTS

MAP N° 6.

SHEWING VILLAGES UNDER TREATMENT ON JUNE 1ST 1898.

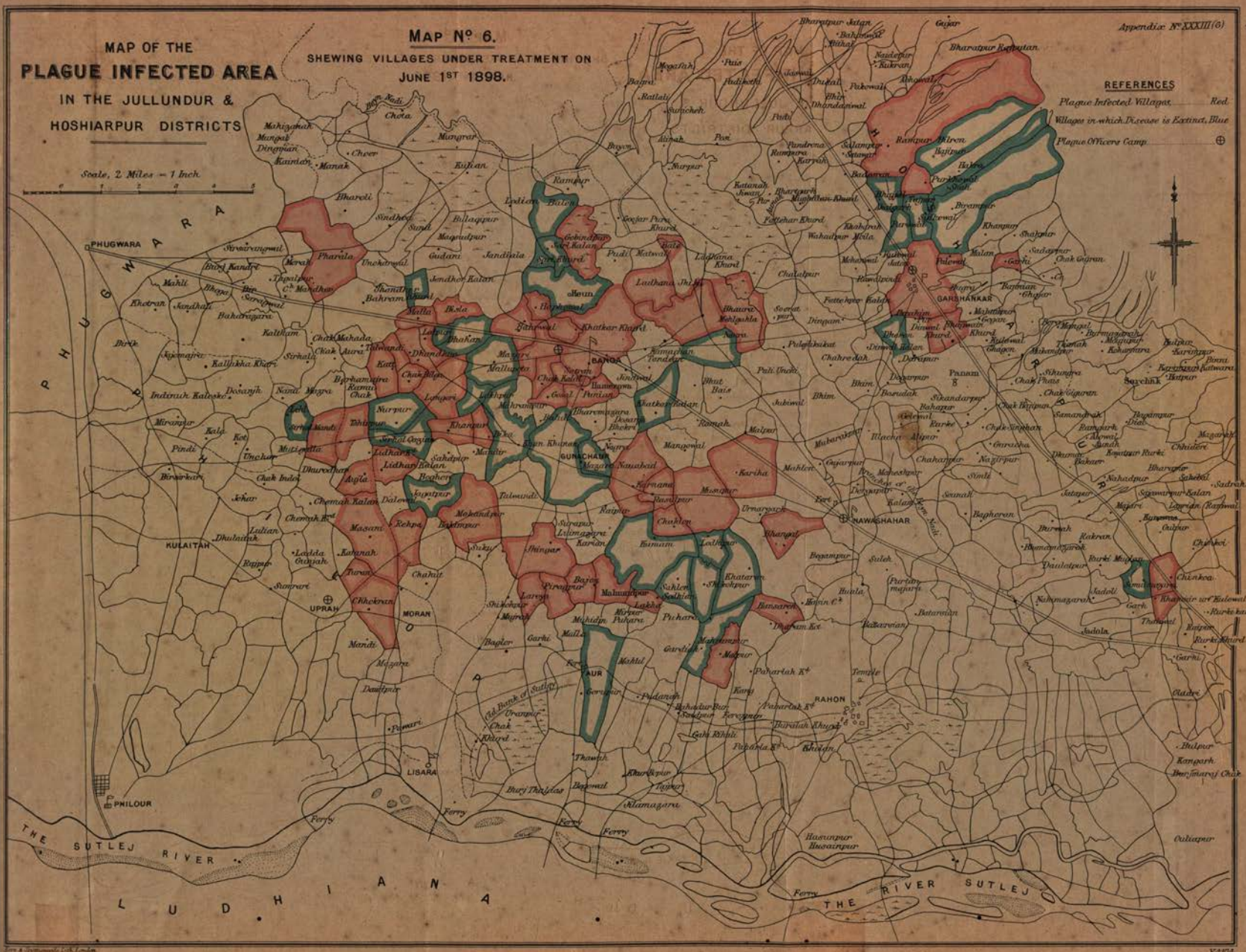
Scale, 2 Miles = 1 Inch.

REFERENCES

Plague Infected Villages. Red.

Villages in which Disease is Extinct. Blue

Plague Officers Camp. ⊕



APPENDIX XXXIV.

TABLE giving the SUMMARY of INFORMATION concerning

Serial Number.	NAME OF VILLAGE.	Census Population.	Roll Call.	Muhammadans.	Hindus.	Chamars.	Sweepers.	Ramdasis.	Number of Houses.	Number of Houses Infected.	Number of Plague Cases returned.	Number of Deaths.	Number of Recoveries.	Date of First Case.
	JULLUNDUR DISTRICT.													
1	Khatkar Kolan	1,400	1,352	244	968	129	11	—	300	71	79	45	34	28 Apr. 1897
2	Jhandher Khurd	800	493	10	336	120	27†	—	72	12	29	19	10	10 Oct. „
3	Khankanan	2,300	2,115	324	1,382	386*	23	—	504	120	175	96	79	15 „ „
4	Khatkar Khurd	377	346	21	182	143*	—	—	77	4	10	6	4	23 Dec. „
5	Shikohpur	592	517	66	332	118	1	—	124	Not stated.	75	41	34	Early in Dec. 1897.
6	Sirhal Qazian	2,026	1,812	677	651	357	55	72	625	54	82	63	19	25 Jan. 1898
7	Mallupota	1,399	1,174	318	659	178	19	—	304	70	91	60	31	28 „ „
8	Gunachaur	3,614	3,021	1,727	831	310	140	13	1,545	1	147	97	50	2 Feb. „
9	Jhandher Khurd	800	493	10	336	120	27†	—	72	1	1	—	1	12 „ „
10	Sahlon	983	979	29	848	102	—	—	157	Not stated.	107	74	33	During Jan. 1898.
11	Mehlgahla	2,548	2,488	192	1,914	307*	75	—	926	60	101	57	44	22 Feb. 1898
12	Kumam	1,969	2,075	855	949	181	90†	—	596	Not stated.	61	45	16	20 „ „
13	Jagatpur	1,729	1,500	212	992	244	9	43	340	40	63	43	20	21 „ „
14	Khatkar Khurd	377	346	21	182	143*	—	—	77	1	3	2	1	27 „ „
15	Katharon	1,020	983	182	615	173	13	—	299	Not stated.	38	22	16	During Jan. 1898.
16	Karnana	1,328	1,436	292	857	264*	23	—	282	1	1	1	0	28 Feb. 1898
17	Balon	282	189	161	—	28	—	—	48	16	28	11	17	16 „ „
18	Lakhpur	445	417	—	324	71*	22†	—	85	18	31	23	8	1 Mar. „
19	Nurpur	443	483	68	322	73	—	20	106	6	19	11	8	28 Feb. „
20	Lodhipur	1,165	1,233	806	274	150	3	—	275	Not stated.	49	33	16	14 „ „
21	Salh Kalan	356	236	191	14	31	—	—	52	„	12	10	2	24 „ „
22	Mahrampur	831	814	64	594	156*	—	—	155	„	56	33	23	7 Mar. „
23	Naura	1,688	1,567	270	1,065	190	42	—	391	1	1	0	1	5 „ „
24	Masani	1,380	1,499	901	224	321	44†	9	312	26	33	24	9	24 Feb. „
25	Banga	5,010	4,727	761	3,221	569*	176	—	1,600	80	103	65	38	7 Mar. „
26	Katt	759	679	38	527	114*	—	—	148	17	29	20	9	24 Feb. „
27	Haphowal	517	585	13	472	100	—	—	106	4	13	3	10	12 Mar. „
28	Chak Bilga	829	831	131	511	181*	8	—	174	28	33	22	11	10 „ „
29	Ddahan	574	535	29	395	103*	8	—	122	31	47	35	12	7 „ „
30	Tahirpur	531	523	96	361	65	1	—	103	17	31	22	9	8 „ „
31	Mazaranauabad	548	597	43	411	129	—	14	113	3	3	2	1	20 „ „
32	Mahmudp	411	394	321	2	71	—	—	80	Not stated.	24	16	8	4 „ „
33	Sotran	308	304	12	282	101	9	—	105	9	17	12	5	10 „ „
34	Musapur	1,721	1,715	522	852	322*	19	—	359	Not stated.	32	23	9	18 „ „
35	Sodhian	291	328	27	212	89*	—	—	55	„	21	13	8	26 „ „
36	Lidhar Kalan	671	672	49	472	83	—	68	163	14	26	14	12	25 „ „
37	Khanpur	628	618	98	369	148	3	—	130	11	22	15	7	27 „ „
38	Bahrwal (*see* No. 74 below)	778	677	54	460	154*	9	—	130	9	22	14	8	23 „ „
39	Mazari	467	432	7	277	133	15	—	92	3	8	4	4	1 Apr. „
40	Salh Khurd	180	152	88	10	37	17†	—	42	8	16	8	8	29 Mar. „
41	Heon	1,283	1,294	860	107	295*	32†	—	255	1	2	1	1	30 „ „
42	Langeri	1,331	1,254	872	169	183	30†	—	266	8	24	18	6	1 Apr. „
43	Lalpur	219	249	223	—	24	2	—	60	10	29	21	8	2 „ „
44	Chahlon	583	549	34	421	94	—	—	115	Not stated.	29	18	11	31 Mar. „
45	Karnana	1,328	1,436	292	857	264*	23	—	282	„	42	24	18	28 Feb. „
46	Bisla	603	500	14	377	106	3	—	Not stated.	10	28	15	13	1 Apr. „
47	Aur (*see* No. 75 below)	2,850	2,662	1,368	1,017	188*	89	—	594	1	1	0	1	5 „ „
48	Malpur	709	584	47	389	142*	6	—	117	4	9	7	2	Unknown
49	Bika	320	353	30	217	97	9	—	73	12	16	10	6	9 Apr. 1898
50	Hansaron	694	657	—	484	162*	11	—	155	Not stated.	40	23	17	14 „ „
51	Sirhal Mandi	851	943	340	483	63	42†	15	242	40	57	34	23	13 „ „
52	Dhandhua	486	492	432	14	40	—	—	115	17	23	13	10	10 „ „
53	M kandpu	3,348	3,045	855	1,679	292	104	115	1,219	12	15	7	8	9 „ „

* Includes Ramdasis also.

† Includes other classes.

the PLAGUE-INFECTED VILLAGES in the PUNJAB, 1897-98.

Serial Number.	Date of First Case returned.	Date of Declaration of Plague.	Date of Cordoning of Village.	Date of Evacuation of Village.	Date of Commencement of Disinfection.	Date of Completion of Disinfection.	Date of Last Case.	Date of Return to Village.	Date of Removal of Cordon.	Date of Village declared Free of Plague.
1	17 Oct. 1897	17 Oct. 1897	17 Oct. 1897	28 Oct. 1897	25 Oct. 1897	28 Dec. 1897	3 Dec. 1897	26 Dec. 1897	6 Jan. 1898	6 Jan. 1898
2	9 Nov. „	9 Nov. „	9 Nov. „	11 Nov. „	13 Nov. „	18 „ „	18 „ „	19 Jan. 1898	29 „ „	29 „ „
3	23 „ „	23 „ „	23 „ „	6 Dec. „	7 Dec. „	5 Mar. 1898	28 Jan. 1898	7 Mar. „	17 Mar. „	17 Mar. „
4	28 Dec. „	28 Dec. „	28 Dec. „	29 „ „	3 Jan. 1898	31 Jan. „	10 „ „	12 Feb. „	19 Feb. „	19 July „
5	1 Feb. 1898	1 Feb. 1898	1 Feb. 1898	2 Feb. 1898	6 Feb. „	29 Mar. „	5 Mar. „	29 Apr. „	9 May „	9 May „
6	3 „ „	3 „ „	3 „ „	13 „ „	15 „ „	8 Apr. „	8 Apr. „	25 „ „	5 „ „	5 „ „
7	12 „ „	12 „ „	12 „ „	21 „ „	28 „ „	20 „ „	24 Mar. „	3 May „	13 „ „	13 „ „
8	13 „ „	13 „ „	13 „ „	1 Mar. „	4 Mar. „	31 May „	28 „ „	21 „ „	31 „ „	31 „ „
9	12 „ „	12 „ „	12 „ „	Not evacuated.	14 Feb. „	14 Feb. „	12 July „	7 Mar. „	7 Mar. „	7 Mar. „
10	23 „ „	23 „ „	23 „ „	4 Mar. 1898	8 Mar. „	26 Apr. „	31 Mar. „	29 Apr. „	9 May „	9 May „
11	23 „ „	23 „ „	23 „ „	17 „ „	23 „ „	20 May „	3 May „	4 June „	10 June „	14 June „
12	26 „ „	26 „ „	26 „ „	6 „ „	19 „ „	30 Apr. „	31 Mar. „	4 May „	14 May „	14 May „
13	27 „ „	27 „ „	27 „ „	10 „ „	12 Feb. „	10 May „	13 Apr. „	16 „ „	22 „ „	26 „ „
14	28 „ „	28 „ „	28 „ „	28 Feb. „	—	—	19 Mar. „	7 Apr. „	17 Apr. „	17 Apr. „
15	1 Mar. „	1 Mar. 1898	1 Mar. „	10 Mar. „	31 Mar. 1898	12 May 1898	16 Apr. „	18 May „	28 May „	28 May „
16	2 „ „	2 „ „	2 „ „	Not evacuated.	19 „ „	20 Mar. „	2 Mar. „	29 Mar. „	29 Mar. „	29 Mar. „
17	2 „ „	2 „ „	2 „ „	4 Mar. 1898	8 „ „	20 Apr. „	2 Apr. „	24 Apr. „	4 May „	4 „ „
18	5 „ „	5 „ „	5 „ „	14 „ „	16 „ „	4 May „	26 Mar. „	5 May „	15 „ „	15 „ „
19	7 „ „	7 „ „	7 „ „	9 „ „	Unknown.	Unknown.	15 Apr. „	3 „ „	13 „ „	13 „ „
20	7 „ „	7 „ „	7 „ „	10 „ „	31 Mar. 1898	9 May 1898	13 „ „	14 „ „	24 „ „	24 „ „
21	8 „ „	8 „ „	8 „ „	15 „ „	20 „ „	20 Apr. „	26 Mar. „	27 Apr. „	5 „ „	5 „ „
22	9 „ „	9 „ „	9 „ „	14 „ „	19 Apr. „	19 May „	30 Apr. „	21 May „	31 „ „	31 „ „
23	10 „ „	10 „ „	10 „ „	10 „ „	28 Mar. „	28 May „	10 Mar. „	3 Apr. „	13 Apr. „	13 Apr. „
24	10 „ „	10 „ „	10 „ „	29 „ „	14 „ „	1 June „	6 May „	2 June „	8 June „	12 June „
25	11 „ „	11 „ „	11 „ „	30 Apr. „	11 „ „	28 „ „	20 June „	29 „ „	5 July „	9 July „
26	12 „ „	12 „ „	12 „ „	16 Mar. „	26 „ „	16 May „	25 Apr. „	23 May „	2 June „	2 June „
27	12 „ „	12 „ „	12 „ „	12 „ „	21 Apr. „	20 „ „	4 May „	28 „ „	7 „ „	7 „ „
28	13 „ „	13 „ „	13 „ „	15 „ „	23 „ „	29 „ „	14 Apr. „	31 „ „	9 „ „	9 „ „
29	13 „ „	13 „ „	13 „ „	15 „ „	3 „ „	3 „ „	2 „ „	7 „ „	17 „ „	17 „ „
30	18 „ „	18 „ „	18 „ „	24 „ „	5 „ „	9 „ „	9 „ „	3 June „	9 „ „	13 „ „
31	21 „ „	21 „ „	21 „ „	23 „ „	1 „ „	4 „ „	27 Mar. „	9 May „	14 May „	19 May „
32	22 „ „	22 „ „	22 „ „	24 „ „	21 „ „	29 „ „	13 Apr „	30 „ „	9 June „	9 June „
33	24 „ „	24 „ „	24 „ „	24 „ „	15 „ „	10 „ „	30 „ „	28 „ „	3 „ „	7 „ „
34	25 „ „	25 „ „	25 „ „	25 „ „	19 „ „	27 „ „	9 May „	28 „ „	8 „ „	8 „ „
35	29 „ „	29 „ „	29 „ „	29 „ „	20 „ „	31 „ „	24 Apr. „	1 June „	11 „ „	11 „ „
36	29 „ „	29 „ „	29 „ „	30 „ „	20 „ „	19 „ „	28 „ „	22 May „	28 May „	1 „ „
37	30 „ „	30 „ „	30 „ „	1 Apr. „	12 „ „	12 „ „	26 „ „	22 „ „	28 „ „	1 „ „
38	1 Apr „	1 Apr. „	1 Apr. „	2 „ „	23 „ „	7 „ „	26 „ „	2 June „	12 June „	12 „ „
39	2 „ „	2 „ „	2 „ „	3 „ „	23 „ „	24 „ „	10 „ „	28 May „	7 „ „	7 „ „
40	3 „ „	3 „ „	3 „ „	6 „ „	4 „ „	5 „ „	10 „ „	7 „ „	17 May „	17 May „
41	3 „ „	3 „ „	3 „ „	4 „ „	10 „ „	28 „ „	3 „ „	24 Apr. „	4 „ „	4 „ „
42	4 „ „	4 „ „	4 „ „	5 „ „	20 „ „	7 June „	4 May „	7 June „	17 June „	17 June „
43	5 „ „	5 „ „	5 „ „	5 „ „	18 „ „	1 May „	23 Apr. „	18 May „	28 May „	28 May „
44	6 „ „	6 „ „	6 „ „	6 „ „	5 May „	1 June „	1 May „	2 June „	12 June „	12 June „
45	6 „ „	6 „ „	6 „ „	7 „ „	12 „ „	10 „ „	3 „ „	11 „ „	22 „ „	22 „ „
46	6 „ „	6 „ „	6 „ „	6 „ „	26 Apr. „	22 May „	22 „ „	8 „ „	18 „ „	18 „ „
47	7 „ „	7 „ „	7 „ „	Not evacuated.	15 „ „	16 Apr. „	7 Apr. „	9 Apr. „	19 Apr. „	19 Apr. „
48	9 „ „	9 „ „	9 „ „	9 Apr. 1898	29 „ „	22 May „	17 „ „	23 May „	2 June „	2 June „
49	10 „ „	10 „ „	10 „ „	10 „ „	20 „ „	10 „ „	17 May „	11 June „	17 „ „	21 „ „
50	13 „ „	13 „ „	13 „ „	13 „ „	4 May „	24 „ „	21 Apr. „	25 May „	4 „ „	4 „ „
51	14 „ „	14 „ „	14 „ „	21 „ „	15 „ „	2 June „	15 May „	6 June „	12 „ „	16 „ „
52	14 „ „	14 „ „	14 „ „	15 „ „	4 „ „	26 May „	7 „ „	9 „ „	20 „ „	20 „ „
53	14 „ „	14 „ „	16 „ „	11 May „	25 „ „	13 June „	10 „ „	13 „ „	21 „ „	23 „ „

TABLE giving the SUMMARY of INFORMATION concerning

Serial Number.	NAME OF VILLAGE.	Census Population.	Roll Call.	Muhammadans.	Hindus.	Chamars.	Sweepers.	Ramdasis.	Number of Houses.	Number of Houses Infected.	Number of Plague Cases returned.	Number of Deaths.	Number of Recoveries.	Date of First Case.
	JULLUNDAR DISTRICT—*cont.*													
54	Gobindpur	1,158	1,140	14	896	230*	—	—	269	11	24	11	13	8 Mar. 1898
55	Leh	487	501	8	371	122	—	—	121	21	34	18	16	12 Apr. „
56	Chak Kalal	315	246	1	185	60	—	—	80	18	33	20	13	17 „ „
57	Punian	454	443	24	331	74	14	—	171	Not stated.	58	25	33	14 „ „
58	Kariha	1,848	1,846	1,407	141	226	72	—	428	„	195	142	53	5 „ „
59	Piragpur	484	413	376	3	34	—	—	104	„	83	61	22	Unknown
60	Rasulpur	636	716	508	36	158	14†	—	146	„	42	25	17	10 Apr. 1898
61	Rehpa	677	743	66	423	150	4	100	145	12	21	12	9	16 „ „
62	Gosal	494	504	37	290	112	35	30	127	10	11	8	3	21 „ „
63	Bhangal	1,014	965	106	719	138	2	—	237	Not stated.	45	32	13	10 „ „
64	Bajon	230	234	197	—	37	—	—	43	„	16	10	6	20 „ „
65	Mallah	443	428	16	336	76	—	—	98	6	11	9	2	21 „ „
66	Aujla	630	424	30	303	91	—	—	109	4	5	4	1	21 „ „
67	Chhokran	847	905	106	620	142	13	24	161	14	10	4	6	16 „ „
68	Laroya	462	520	246	201	73	—	—	98	Not stated.	13	10	3	21 „ „
69	Pharala	3,214	2,982	479	1,964	405	134	—	931	10	18	7	11	Unknown
70	Ladhana Jhika	1,259	1,327	70	1,093	145	19	—	300	4	9	5	4	11 May 1898
71	Bhaura	1,004	1,030	485	328	150	67†	—	232	3	4	2	2	1 „ „
72	Turan	233	185	32	119	0	34†	—	47	3	4	2	2	25 „ „
73	Jhingar	1,103	1,226	60	793	340	33	—	225	Not stated.	13	7	6	28 Apr. „
74	Bahrwal (*see* No. 38 above)	778	677	54	460	154*	9	—	130	„	1	—	1	22 July „
75	Aur (*see* No. 47 above)	2,850	2,662	1,368	1,017	188*	89	—	594	3	4	0	4	5 Apr. „
	HOSHIURPUR DISTRICT.													
1	Birampur	1,505	1,493	1,086	183	147*	77	—	347	40	49	34	15	5 Nov. 1897
2	Purkhowal	712	776	624	49	103	—	—	166	14	23	12	11	27 Jan. 1898
3	Rampur Bilron	2,505	2,850	355	2,116	244	135	—	553	34	43	16	27	31 „ „
4	Simul Mazara	1,003	1,019	55	764	184	16	—	194	31	51	34	17	28 „ „
5	Dheron	147	165	69	40	56	0	—	39	4	4	—	4	27 „ „
6	Bhajjal	530	484	57	357	70	—	—	107	27	52	37	15	6 Feb. „
7	Sadhowal	332	338	251	2	85	—	—	62	14	22	16	6	Unknown
8	Hajipur	864	784	55	672	57	—	—	214	69	90	62	28	6 Mar. 1898
9	Parowal	296	260	—	164	96	—	—	54	9	30	20	10	18 „ „
10	Garhshankar	6,000	5,354	3,293	1,448	135	478	—	1,278	124	157	75	82	23 „ „
11	Sanwali	165	154	98	11	45	—	—	34	8	16	9	7	Unknown
12	Kulewal	179	310	127	149	34	—	—	59	14	27	13	14	„
13	Garhi	1,696	919	46	665	201	7	—	184	48	110	64	46	„
14	Chinkos	886	901	518	191	166	26	—	180	10	14	8	6	21 Apr. 1898
15	Bhagwain	357	360	24	270	66*	—	—	78	9	11	7	4	12 May „
16	Palewal	600	584	3	480	101	—	—	125	6	4	1	3	Not dated

* Includes Ramdasis also.

† Includes other classes.

the PLAGUE-INFECTED VILLAGES in the PUNJAB, 1897-98—*continued.*

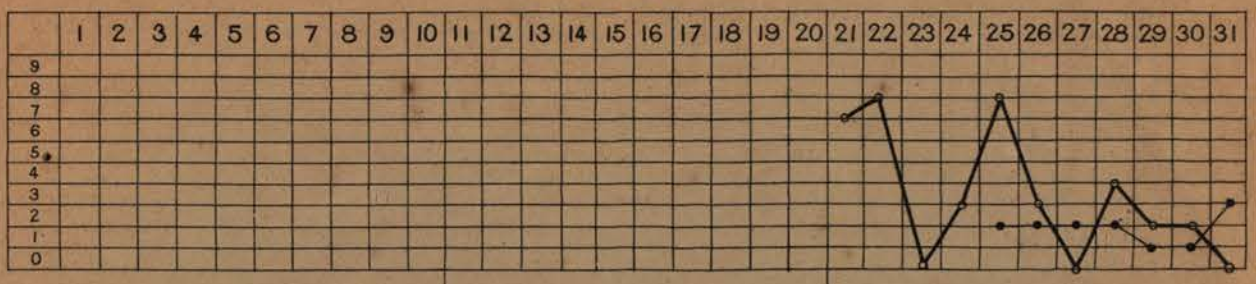
Serial Number.	Date of First Case returned.	Date of Declaration of Plague.	Date of Cordoning of Village.	Date of Evacuation of Village.	Date of Commencement of Disinfection.	Date of Completion of Disinfection.	Date of Last Case.	Date of Return to Village.	Date of Removal of Cordon.	Date of Village declared Free of Plague.
54	15 Apr. 1898	15 Apr. 1898	15 Apr. 1898	25 Apr. 1898	25 Apr. 1898	4 June 1898	13 May 1898	7 June 1898	18 June 1898	18 June 1898
55	17 „ „	17 „ „	17 „ „	18 „ „	10 May „	26 May „	13 „ „	31 „ „	31 „ „	31 „ „
56	17 „ „	17 „ „	17 „ „	3 „ „	8 „ „	31 „ „	27 Apr. „	4 „ „	10 „ „	14 „ „
57	18 „ „	18 „ „	18 „ „	25 „ „	28 Apr. „	1 June „	4 May „	16 „ „	22 „ „	27 „ „
58	20 „ „	20 „ „	20 „ „	4 May „	28 May „	16 „ „	4 June „	19 „ „	12 July „	1 July „
59	21 „ „	21 „ „	21 „ „	1 „ „	18 „ „	12 „ „	11 May „	14 „ „	25 June „	1 June „
60	22 „ „	22 „ „	22 „ „	29 Apr. „	17 „ „	7 „ „	7 „ „	8 „ „	18 „ „	18 „ „
61	22 „ „	22 „ „	22 „ „	22 „ „	8 „ „	30 May „	9 „ „	2 „ „	8 „ „	12 „ „
62	22 „ „	22 „ „	22 „ „	25 „ „	7 „ „	5 June „	5 „ „	10 „ „	16 „ „	20 „ „
63	24 „ „	24 „ „	24 „ „	27 „ „	16 „ „	11 „ „	8 „ „	12 „ „	22 „ „	22 „ „
64	26 „ „	26 „ „	26 „ „	29 „ „	17 „ „	5 „ „	7 „ „	6 „ „	16 „ „	16 „ „
65	26 „ „	26 „ „	26 „ „	26 „ „	7 „ „	8 „ „	30 Apr. „	14 „ „	24 „ „	24 „ „
66	27 „ „	27 „ „	27 „ „	13 May „	Unknown	Unknown	18 May „	7 „ „	13 „ „	17 „ „
67	10 May „	10 May „	10 May „	13 „ „	2 June 1898	14 June 1898	25 „ „	15 „ „	21 „ „	25 „ „
68	18 „ „	18 „ „	18 „ „	18 „ „	5 „ „	19 „ „	3 June „	23 „ „	30 „ „	30 „ „
69	19 „ „	19 „ „	19 „ „	20 „ „	31 May „	27 „ „	19 „ „	2 July „	26 July „	31 July „
70	21 „ „	21 „ „	21 „ „	22 „ „	1 June „	16 „ „	24 May „	17 June „	22 June „	27 June „
71	25 „ „	25 „ „	25 „ „	26 „ „	30 May „	16 „ „	27 „ „	19 „ „	25 „ „	29 „ „
72	25 „ „	25 „ „	25 „ „	25 „ „	2 June „	12 „ „	27 „ „	15 „ „	21 „ „	25 „ „
73	26 „ „	26 „ „	26 „ „	26 „ „	5 „ „	21 „ „	3 June „	30 „ „	10 July „	10 July „
74	23 July „	23 July „	23 July „	Not evacuated.	4 July „	5 July „	23 „ „	10 July „	12 „ „	12 „ „
75	23 „ „	23 „ „	23 „ „	23 July 1898	11 Aug. „	8 Sept. „	24 July „	10 Sept. „	20 Sept. „	20 Sept. „
1	11 Dec. 1897	11 Dec. 1897	11 Dec. 1897	26 Dec. 1897	16 Feb. „	12 Mar. „	6 Feb. „	15 Mar. „	26 Mar. „	26 Mar „
2	3 Feb. 1898	3 Feb. 1898	3 Feb. 1898	3 Feb. 1898	15 „ „	2 Apr. „	10 Mar. „	2 Apr. „	18 Apr. „	18 Apr. „
3	6 „ „	6 „ „	6 „ „	6 May „	16 May „	23 June „	17 June „	12 July „	18 July „	18 July „
4	9 „ „	9 „ „	9 „ „	5 Mar. „	14 Mar. „	18 Apr. „	1 Apr. „	19 Apr. „	2 May „	2 May „
5	19 „ „	19 „ „	19 „ „	20 Feb. „	14 „ „	19 Mar. „	18 Feb. „	19 Mar. „	30 Mar. „	30 Mar. „
6	21 „ „	21 „ „	21 „ „	24 „ „	14 „ „	7 Apr. „	30 Mar. „	14 Apr. „	19 Apr. „	19 Apr. „
7	6 Mar. „	6 Mar. „	6 Mar. „	6 Mar. „	7 Apr. „	15 „ „	27 „ „	17 „ „	19 „ „	19 „ „
8	9 „ „	9 „ „	9 „ „	2 Apr. „	20 „ „	2 May „	27 Apr. „	28 „ „	8 May „	8 May „
9	24 „ „	24 „ „	24 „ „	24 Mar. „	20 „ „	2 „ „	29 „ „	25 „ „	7 „ „	7 „ „
10	30 „ „	30 „ „	30 „ „	May „	8 May „	25 June „	23 June „	9 July „	15 July „	15 July „
11	4 Apr. „	4 Apr. „	4 Apr. „	5 Apr. „	27 Apr. „	3 May „	10 Apr. „	4 May „	5 May „	5 May „
12	15 „ „	15 „ „	15 „ „	30 „ „	7 May „	12 June „	2 June „	14 June „	20 June „	20 June „
13	20 „ „	20 „ „	20 „ „	30 „ „	10 „ „	8 „ „	22 May „	11 „ „	18 „ „	18 „ „
14	23 „ „	23 „ „	23 „ „	1 May „	7 „ „	7 „ „	7 June „	17 „ „	22 „ „	22 „ „
15	19 May „	19 May „	19 May „	20 „ „	1 June „	21 „ „	28 May „	23 „ „	28 „ „	28 „ „
16	3 June „	3 June „	3 June „	13 June „	15 „ „	12 July „	12 June „	16 July „	21 July „	21 July „

APPENDIX, No. XXXV (1)

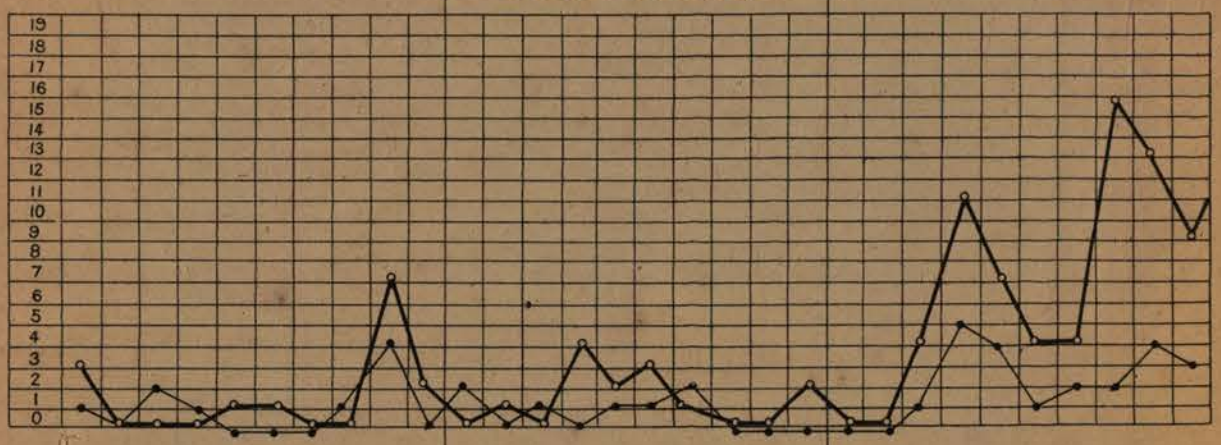
CHART OF DAILY PLAGUE CASES AND DEATHS IN THE PUNJAB—

(See Note at bottom of p. 413.)

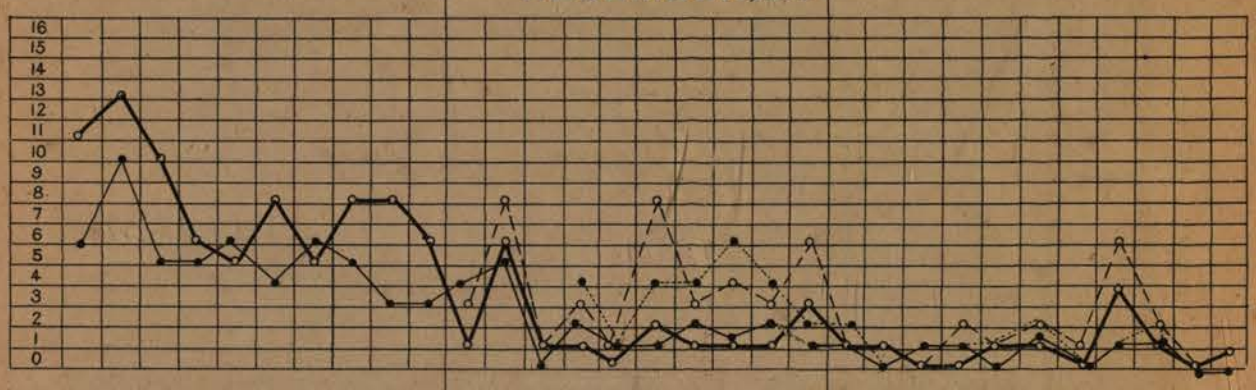
OCTOBER, 1897.



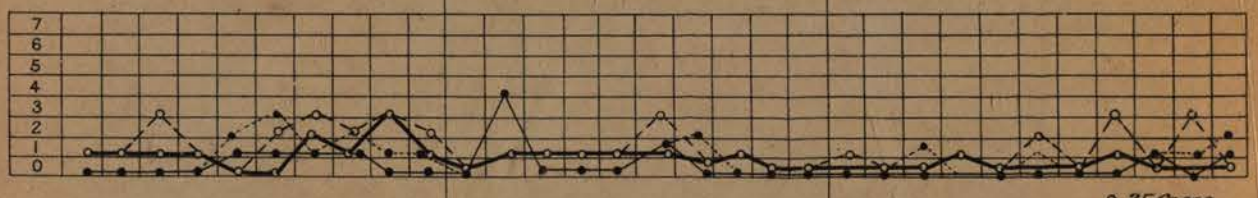
NOVEMBER, 1897.



DECEMBER, 1897.



JANUARY, 1898.



FEBRUARY, 1898.

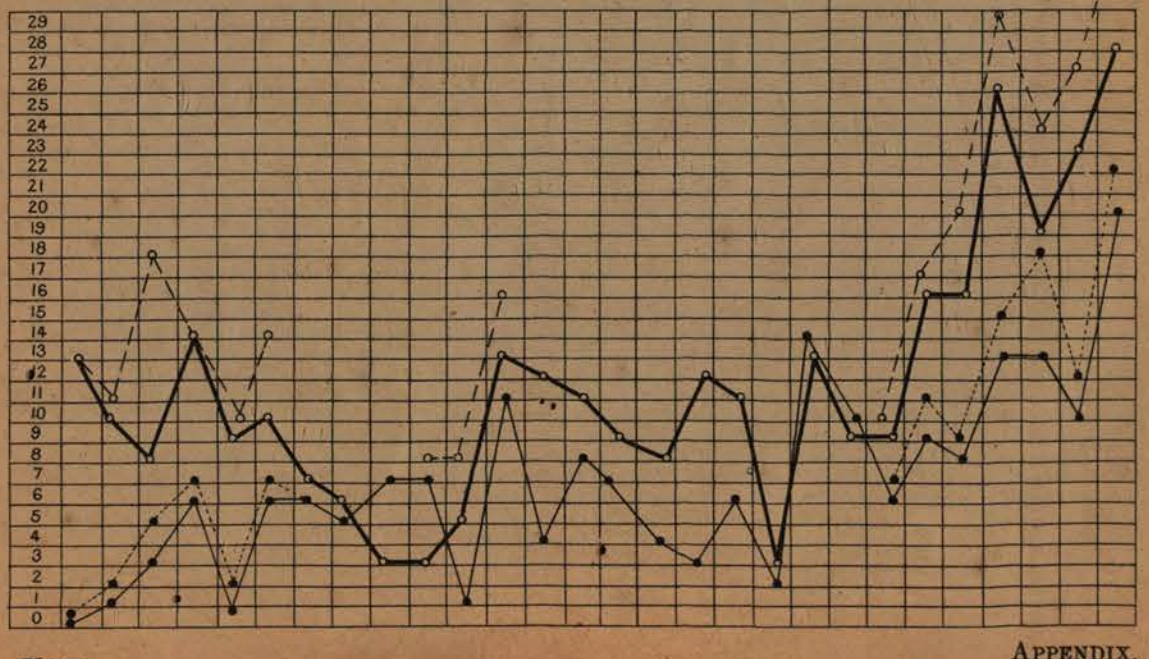
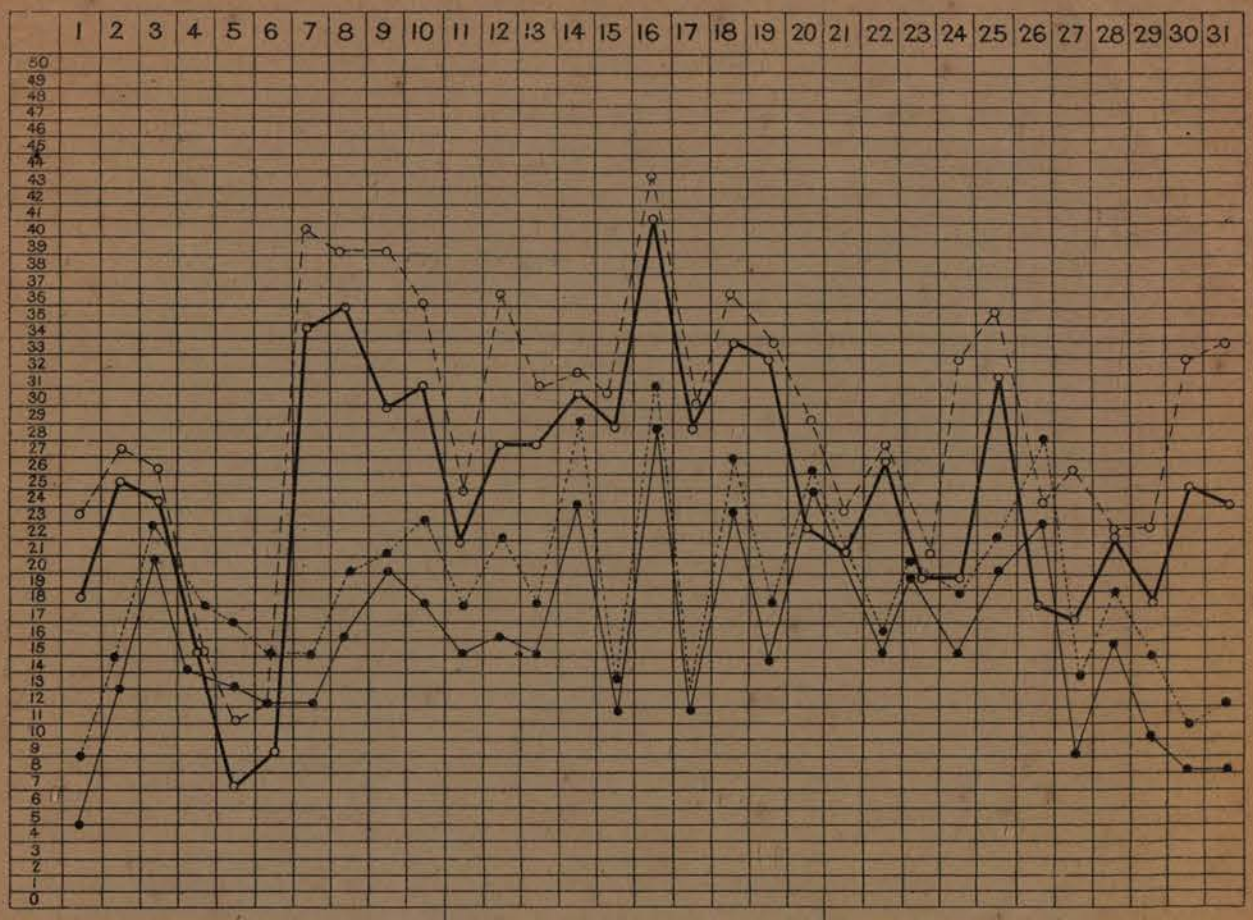


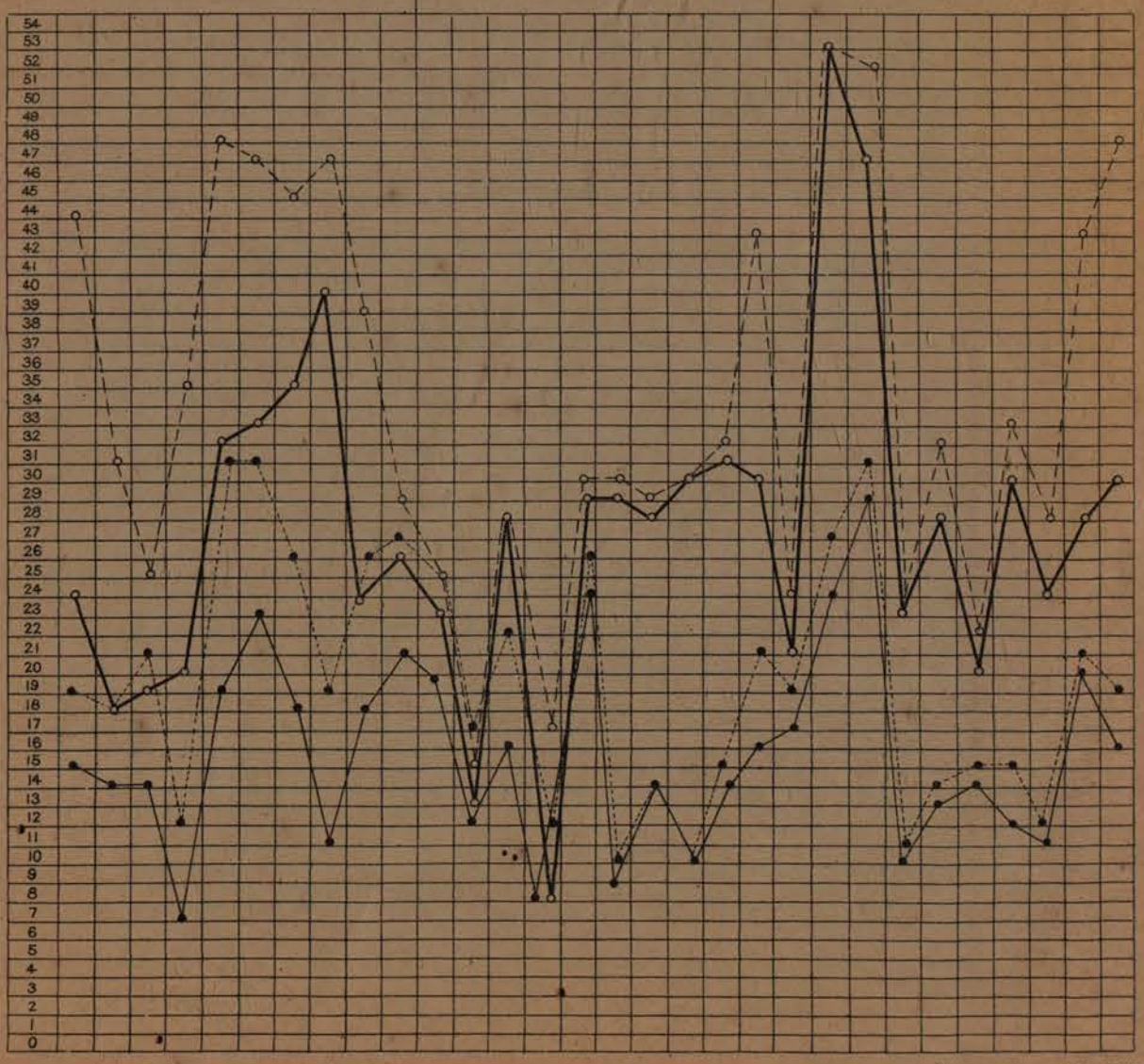
CHART OF DAILY PLAGUE CASES AND DEATHS IN THE PUNJAB—(*continued*).

(See Note at bottom of p. 413.)

MARCH, 1898.



APRIL, 1898.

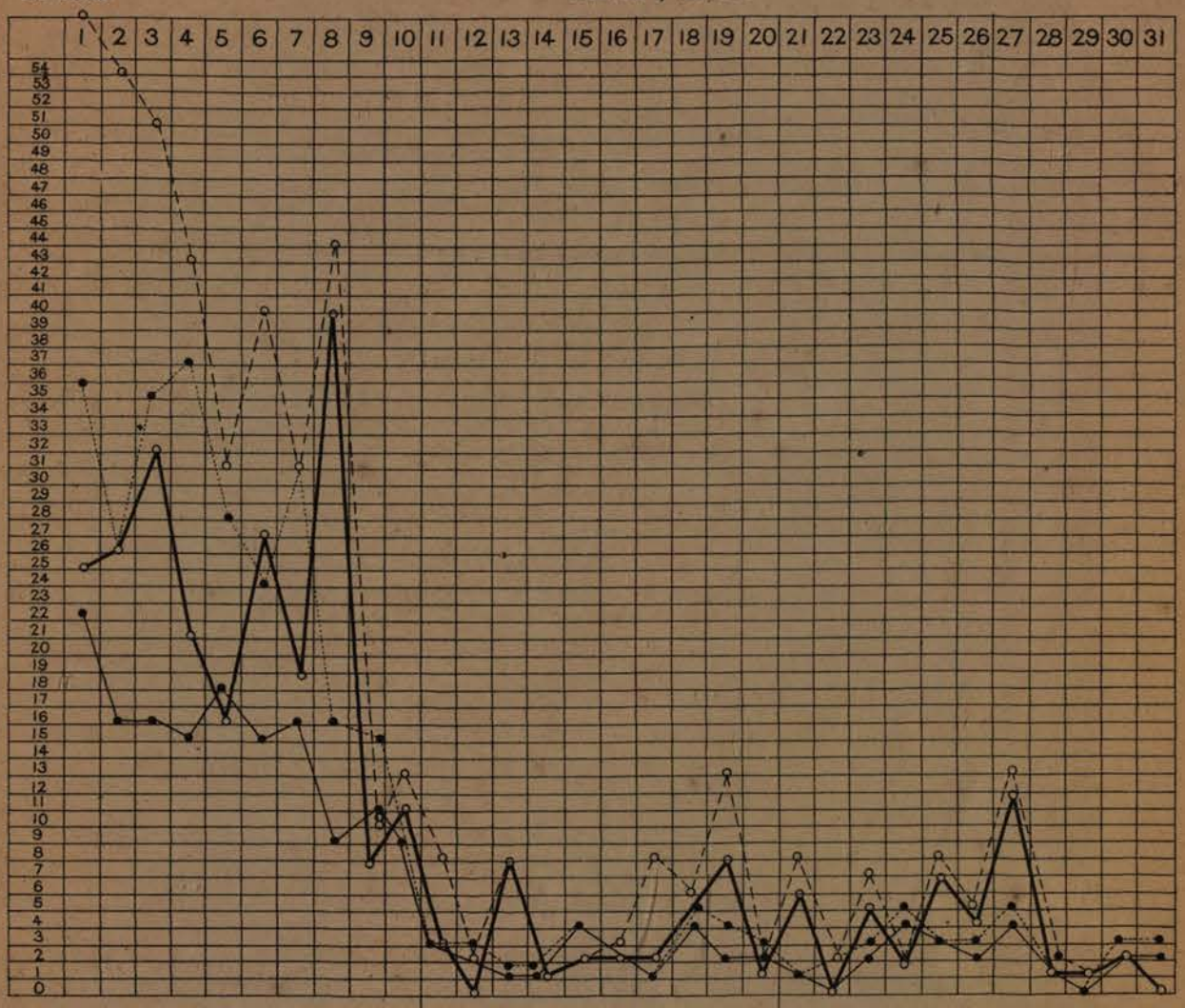


Y.4174.

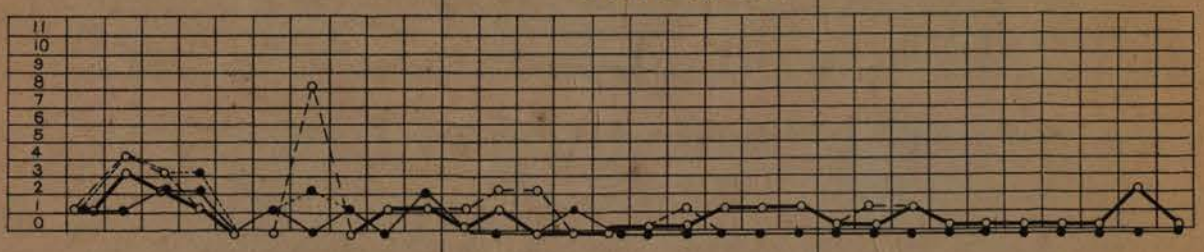
CHART OF DAILY PLAGUE CASES AND DEATHS IN THE PUNJAB—(*concluded*).

88 Cases

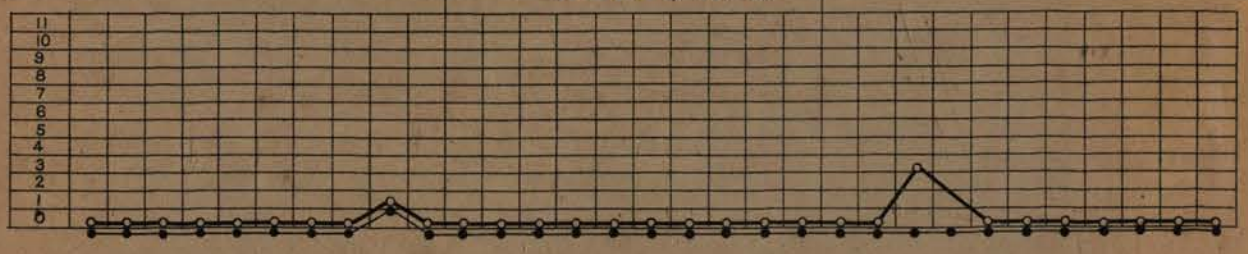
MAY, 1898.



JUNE, 1898.



JULY, 1898.



Note. ——— The thick black line indicates the cases of plague in the Jullundur district.
——— The thin line, the deaths from plague in the same district.
- - - - - - The black dash line indicates the total cases in both the Jullundur and Hoshiarpur districts.
..... The dotted black line, the total deaths in the two districts.
The figures on the left hand indicate the actual numbers of cases and deaths.

Y. 4174.

Appendix No. XXXVI
(See Question No. 10,235)

MAP SHOWING THE NORTHERN PORTION OF BĀNGA TOWN IN THE JULLUNDUR DISTRICT OF THE PANJAB

FIRST INFECTED BY PLAGUE

FT. 100 50 0 100 FT

LALARI MUHALLA

KIRPA RAM'S MUHALLA

SODIAN MUHALLA

BASHAMBAR DAS MUHALLA

SAGRA MUHALLA

CHABUTRA MUHALLA

HEON GATE

DARWAZA MUSUNDAN

LUTIAN MUHALLA

KHOJIAN

RAMDASIS

MUHALLA TELIAN

ARTI MUHALLA

SURANDA MUHALLA

AMAR NATH'S KUCHA

MUHALLA RORIAN

NAWA BAZAR

KAMORA'S SHOP

WELL

PIPAL

REFERENCE

- *First Infected Muhalla Evacuated*
- *Second d° d°*
- *Third d° d°*
- *Fourth d° d°*
- *Subsequently Infected d°*
- *Plague Cases* ----------

Y 3905.

Appendix No. XXXVI

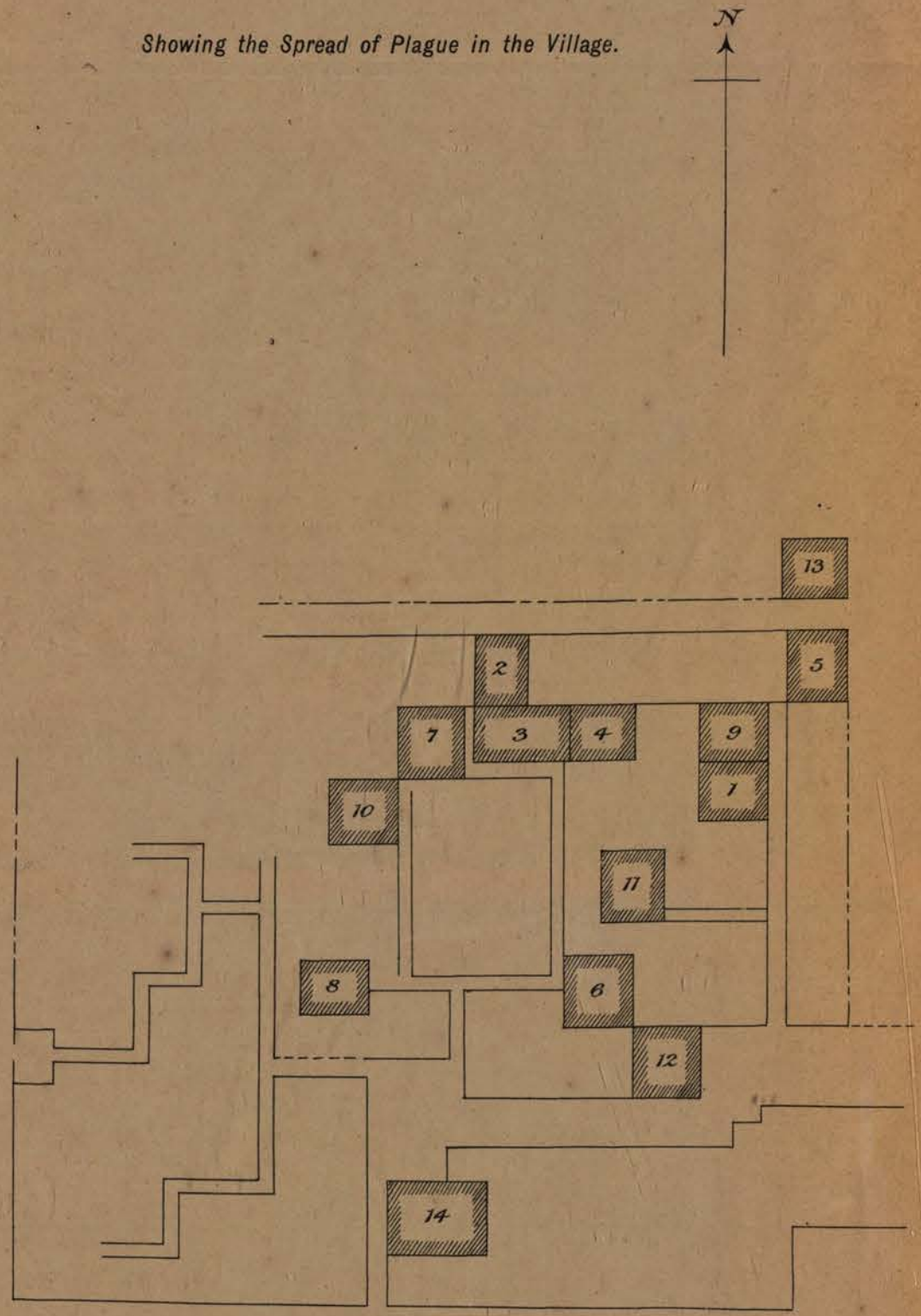
PLAN

OF

LIDHAR KALAN.

IN THE JULLUNDUR DISTRICT OF THE PUNJAB.

Showing the Spread of Plague in the Village.



The numbers show the order of the houses in which plague cases occurred.

(*See* Question, No. 10,456.)

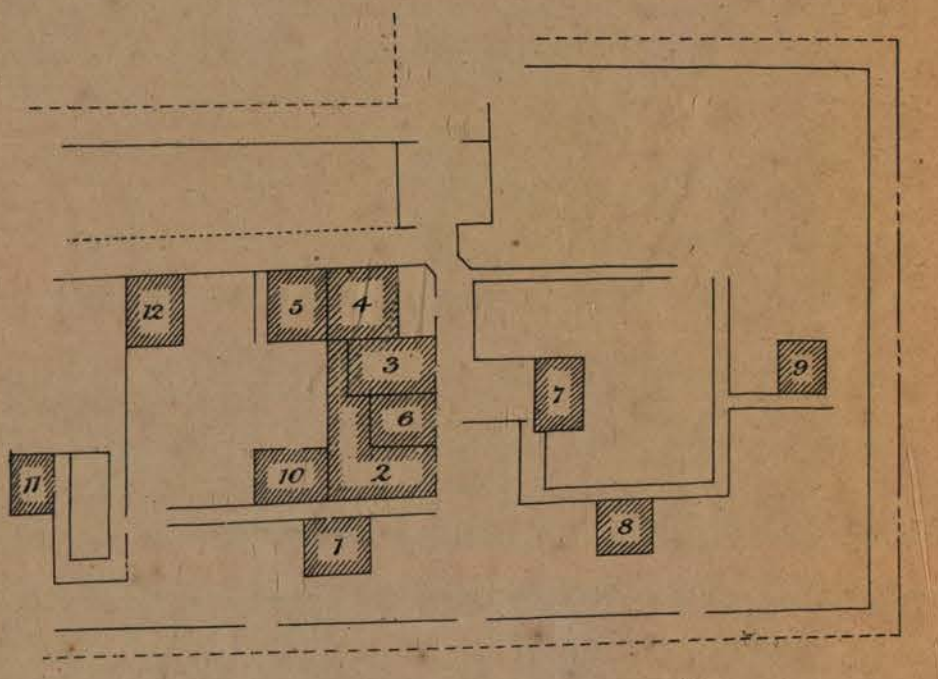
PLAN

OF

BIKA,

IN THE JULLUNDUR DISTRICT OF THE PUNJAB.

Showing the Spread of Plague in the Village.

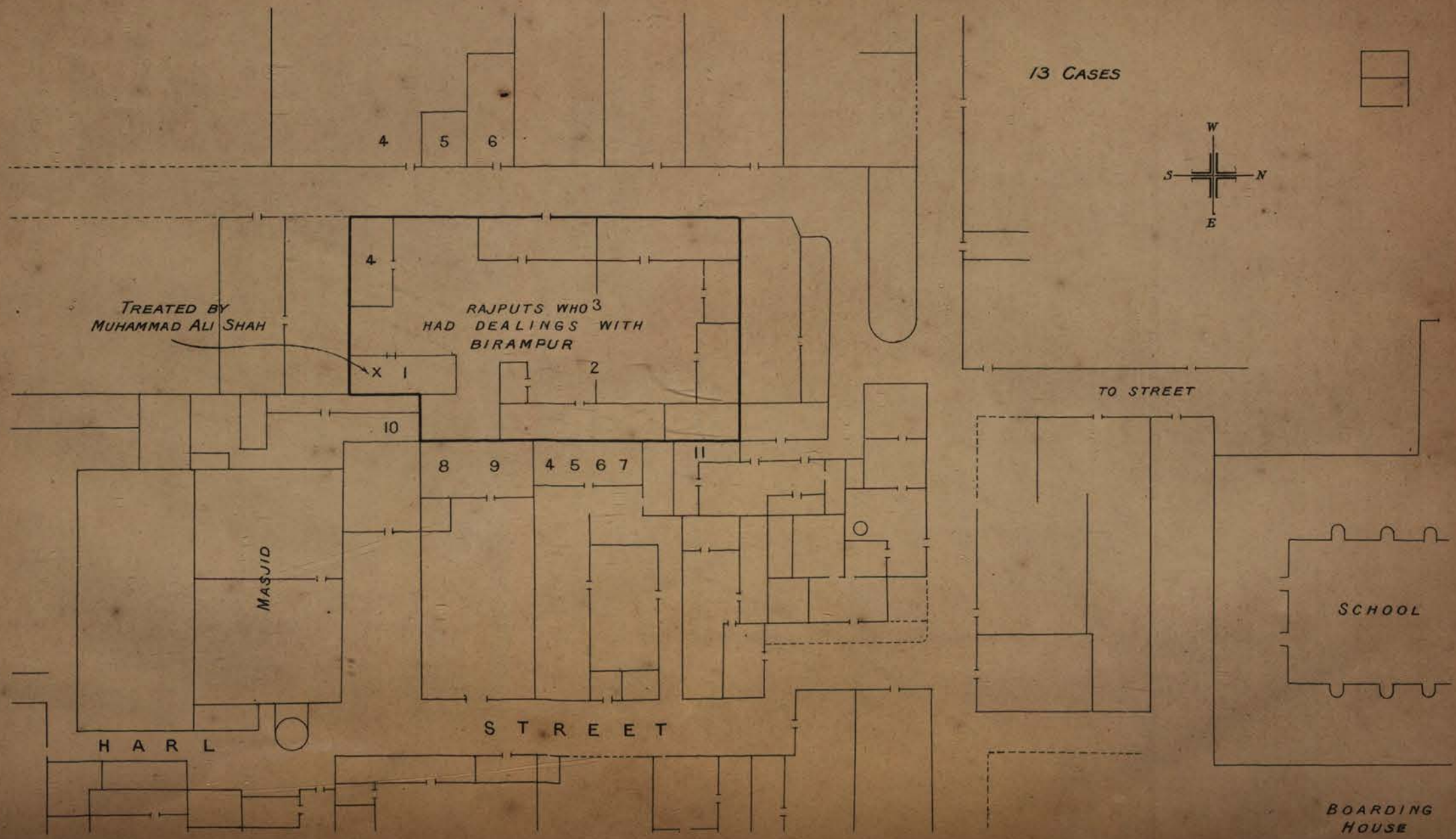


The numbers show the order of the houses in which plague cases occurred.

(*See* Question, No. 10,845.)

ROUGH PLAN OF FIRST INFECTED PART OF GARHSHANKAR,

IN THE HOSHIARPUR DISTRICT OF THE PUNJAB.



Wt 4174

APPENDIX No. XL.

REPORT

ON THE

EFFECT OF PREVENTIVE INOCULATION

WITH

MONSIEUR HAFFKINE'S PLAGUE PROPHYLACTIC IN KARACHI,

BY

MR. KAKA, HEALTH OFFICER TO THE MUNICIPALITY.

Within a very short period of the appearance of the disease in Karachi, in his letter, No. 1,111, dated 9th April 1898, the Health Officer requested the Municipality to introduce inoculation among the people. As, however, the plague administration was entirely in the hands of the Plague Committee, the Managing Committee did not choose to take the initiative. Subsequently, on the recommendation of the Municipal Secretary, Mr. Brunton, a member of the Plague Committee, this body passed the following Resolutions:

Extract paragraph 9 from the Proceedings of the Plague Committee, dated 2nd May 1898.

"That any person who has undergone inoculation will be permitted to go into a health camp or such other place, being within the Municipal limits, as the Superintendent of his quarter may approve, instead of undergoing segregation, provided that the operation was performed four days prior to the removal of a case of plague on account of which he would otherwise have been segregated."

Extract paragraph 3 from the Proceedings of the Plague Committee, dated 6th May 1898.

"That, with reference to paragraph 9 of the Plague Committee's proceedings, No. 70, of 2nd May 1898, stations should be appointed and medical officers nominated for the purpose of carrying out inoculation.

"The medical officers and stations to be as follow:—

(1) Dr. Kaka, D.P.H. -	Max Denso Hall, from 9 a.m. to 10 a.m. and 3.30 p.m. to 4.30 p.m.
(2) Assist.-Surg. George	Sind Arts College, from 7 a.m. to 8 a.m. and 3.30 p m. to 4.30 p.m.
(3) Surg.-Capt. Fleury, A.M.S.	Edalji Dinshah Dispensary, Sadar Bazaar, from 12.30 p.m. to 1.30 p.m.
(4) Babu Balvantsing Kalkaparsad	Trans-Lyari Dispensary, from 7 a.m. to 8 a.m. and 4 p.m. to 5 p.m.
(5) Surg.-Capt. Jenney, I.M.S.	Keamari, on such days and hours as may be arranged. To be notified locally.
(6) Surg.-Capt. Arnim, I.M.S.	Lawrence Road Camp from 9 a.m. to 10 a.m.

"A certificate must be given to every person inoculated at each station. All private practitioners, desiring that their patients should obtain certificates, must bring them to the Max Denso Hall and inoculate them at the hours appointed for Dr. Kaka, D.P.H.

"In the case of *parda nashin* ladies only, inoculation may be carried out by Dr. Miss Arnott at their own houses.

"A special form of certificate will be issued by medical officers in charge of inoculation stations.

"A notification will be announced by tom-tom when sufficient lymph has been obtained from Bombay."

A large supply of serum was ordered from Professor Haffkine's laboratory at Bombay, and the several medical officers appointed by the Plague Committee carried on inoculation work at fixed hours.

Before, however, the Plague Committee took action, the Khojas of Karachi, on the recommendation of H. H. Aga Khan, C.I.E., came forward to be inoculated. They got their own stock of serum from Bombay, and the Health Officer commenced inoculating them on the 25th April 1898.

With the relaxation of the Plague Committee's rules regarding segregation, the number of persons presenting themselves for the operation at the inoculation stations rapidly increased.

The total number of inoculations performed in Karachi was 6,393. 6,106 persons, comprising 3,911 males and 2,195 females, were inoculated. 287 persons, comprising 155 males and 132 females, were inoculated twice: 5,819 persons, comprising 3,756 males and 2,063 females, were inoculated once.

Inoculation commenced on 13th April 1898, the last operations being performed on the 19th July following.

The following statement gives the weekly number of persons inoculated:—

Week ending	Number of Persons.		Total.
	Males.	Females.	
15 April 1898 - - -	19	—	19
22 " " - - -	20	5	25
29 " " - - -	112	12	124
6 May " - - -	538	373	911
13 " " - - -	840	403	1,245
20 " " - - -	649	322	971
27 " " - - -	651	343	994
3 June " - - -	331	126	457
10 " " - - -	378	253	631
17 " " - - -	186	203	389
24 " " - - -	106	84	190
1 July " - - -	35	34	69
8 " " - - -	13	10	23
15 " " - - -	24	17	41
22 " " - - -	9	8	17
Total - -	3,911	2,195	6,106

The following statement shows the weekly numbers of plague cases and deaths from the commencement of the second outbreak to the week ending 4th November 1898:—

Week ending	Number of Plague Cases.			Number of Plague Deaths.			Week ending	Number of Plague Cases.			Number of Plague Deaths.		
	Males.	Females.	Total.	Males.	Females.	Total.		Males.	Females.	Total.	Males.	Females.	Total.
25 Mar. 1898 -	1	—	1	—	—	—	29 July 1898 -	16	7	23	14	5	19
1 April „ -	7	—	7	—	—	—	5 Aug. „ -	13	6	19	11	4	15
8 „ „ -	18	2	20	13	—	13	12 „ „ -	7	7	14	6	5	11
15 „ „ -	54	22	76	40	12	52	19 „ „ -	5	4	9	3	2	5
22 „ „ -	144	35	179	103	28	131	26 „ „ -	12	7	19	7	3	10
29 „ „ -	209	105	314	154	67	221	2 Sept. „ -	5	4	9	5	—	5
6 May „ -	454	191	645	379	158	537	9 „ „ -	1	1	2	—	1	1
13 „ „ -	414	194	608	341	146	487	16 „ „ -	2	5	7	1	3	4
20 „ „ -	269	139	408	243	124	367	23 „ „ -	6	4	10	3	4	7
27 „ „ -	190	90	280	139	68	207	30 „ „ -	2	2	4	1	—	1
3 June „ -	99	97	196	76	76	152	7 Oct. „ -	3	1	4	3	2	5
10 „ „ -	93	51	144	61	40	101	14 „ „ -	3	2	5	2	3	5
17 „ „ -	57	34	91	41	33	74	21 „ „ -	4	3	7	—	1	1
24 „ „ -	29	18	47	19	15	34	28 „ „ -	2	—	2	1	—	1
1 July „ -	24	7	31	16	6	22	4 Nov. „ -	4	2	6	3	—	3
8 „ „ -	5	14	19	5	9	14							
15 „ „ -	7	4	11	4	5	9							
22 „ „ -	15	6	21	13	4	17	Total -	2,174	1,064	3,238	1,707	824	2,531

The following statement gives the weekly number of persons inoculated, classed according to castes:—

Week ending	Hindus.			Muhammadans.			Parsis.			Christians.			Other Castes.		
	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.	Males.	Females.	Total.
15 April 1898 -	—	—	—	—	—	—	—	—	—	—	—	—	19	—	19
22 „ „ -	—	—	—	13	5	18	—	—	—	—	—	—	7	—	7
29 „ „ -	9	—	9	36	—	36	14	6	20	5	3	8	48	3	51
6 May „ -	55	2	57	356	344	700	56	16	72	37	7	44	34	4	38
13 „ „ -	203	37	240	473	273	746	97	63	160	45	24	69	22	8	30
20 „ „ -	274	67	341	260	221	481	71	17	88	17	7	24	27	10	37
27 „ „ -	410	165	575	183	155	338	27	13	40	10	4	14	21	6	27
3 June „ -	189	79	268	73	31	104	9	15	24	5	1	6	55	—	55
10 „ „ -	132	103	235	215	145	360	6	—	6	3	4	7	22	1	23
17 „ „ -	37	78	115	143	119	262	1	4	5	3	—	3	2	2	4
24 „ „ -	43	16	59	63	66	129	—	—	—	—	1	1	—	1	1
1 July „ -	16	7	23	19	27	46	—	—	—	—	—	—	—	—	—
8 „ „ -	9	7	16	4	3	7	—	—	—	—	—	—	—	—	—
15 „ „ -	24	17	41	—	—	—	—	—	—	—	—	—	—	—	—
22 „ „ -	9	8	17	—	—	—	—	—	—	—	—	—	—	—	—
Total -	1,410	586	1,996	1,838	1,389	3,227	281	134	415	125	51	176	257	35	292

The following statement gives the number of persons inoculated, classified according to age-groups and castes:—

Castes.	1-4.		5-14.		15-24.		25-54.		55 and upwards.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
Hindus -	55	44	337	189	390	146	590	194	151	13
Muhamamdans	136	113	492	444	371	296	744	496	95	49
Parsis -	17	2	107	72	66	30	80	30	11	—
Christians -	6	3	17	17	35	11	63	15	4	5
Other Castes -	2	—	29	14	85	6	138	15	3	—
Total -	216	162	982	736	947	489	1,615	750	151	58

Occurrence of Plague among the Inoculated.

It is not practicable to come to any definite conclusion as to the efficacy of inoculation in the absence of correct information regarding the population of Karachi during the second epidemic of plague.

The population within the Municipal limits of the city as enumerated at the census of 1881 was 98,195. The estimated population of the year 1898 is 124,668. This estimate is based upon the observed rate of increase between the census years 1881 and 1891.

It has been acknowledged that the population within Municipal limits has been reduced by over a quarter of lakh. It may, therefore, be assumed that the average population during the second outbreak of plague was what it was at the census of 1891, *i.e.*, 98,195; in other words, it may be said to have been reduced by 26,473 persons.

Assuming, then, that the average population (excluding persons who died from all other causes, with the exception of plague, from the commencement of the outbreak up to the week ending 12th August 1898) within the Municipal limits of Karachi, during the second outbreak, was 98,195, and deducting therefrom the 6,106 inoculated persons, the number of un-inoculated comes up to 92,089.

The first case of the second outbreak was reported on 25th March 1898.

Up to the week ending 12th August last, 3,154 cases, with 2,483 deaths, were reported from plague throughout the whole of Karachi. Excluding 21 cases with 12 deaths occurring within cantonments, which is outside Municipal limits, and 10 cases and 9 deaths that were imported, the total cases and deaths in both inoculated and un-inoculated, up to 12th August 1898, were 3,123 and 2,462, respectively.

During the 14 weeks commencing from the week ending 13th May to the week ending 12th August 1898, 44 cases of plague with 25 deaths were reported among the inoculated.

Three cases with no deaths were reported during the week ending 21st October 1898. As these have occurred among persons five months after inoculation, they have not been taken into account, and have been added to the 92,089 un-inoculated persons, bringing the total un-inoculated population up to 92,094.

Within the Municipal limits of Karachi, then, up to the week ending 12th August 1898, the 92,092 un-inoculated persons had 3,079 cases and 2,437 deaths and the 6,103 inoculated had 44 cases and 25 deaths from plague among them. In the former case, the total mortality from plague comes up to 2·6 per cent. and the case mortality (*i.e.*, the percentage of deaths to attacks) to 79 per cent. In the latter case, the total mortality comes up to 0·44 per cent. and the case mortality to 56 per cent.

Calculated upon the mortality among the uninoculated, the 6,103 inoculated should have had 161 deaths and not 25, which is a difference in the mortality of 84 per cent. These results, however, must be accepted with reservation, as the actual population of Karachi during the plague is not accurately known.

Fifty-six statements called for in Government Resolution No. $\frac{4922}{5208}$ P., dated 2nd September 1898, accompany this report. These give particulars of attacks among inoculated and uninoculated persons residing in houses the inmates of which submitted to the operation. The first 40 show attacks among the inoculated, the rest among the uninoculated. Forms Nos. 3, 8, 11, and 45 are cases really occurring in one house. These, however, have been shown separately, as different families occupied different tenements of the house, and the persons were attacked on different dates.

Thawar Megji and Mulbai Megji, shown in Form 3, were occupying one ground-floor tenement. They were attacked five days after inoculation. Rakhia Musa and Shiva Jiwraj, shown in Forms 8 and 11 respectively, were occupying the two remaining adjoining ground-floor tenements of plot No. 74A—12, Chandumal Street, Machi Miani Quarter. The former was attacked 12 days, and the latter 11 days, after inoculation. Thus, out of five inoculated persons who were occupying three ground-floor tenements of this plot, four attacks with one death, were reported. The one uninoculated person residing with Rakhia Musa escaped.

The whole family shown in Form 45, comprising nine members, of whom one was not inoculated, occupied the two upper stories of the plot. The uninoculated was attacked and died,

Thus, the whole house comprised 15 members, of whom two were not inoculated. The 13 inoculated had four cases with one death; out of the two uninoculated, one who was attacked died.

The following statement gives full particulars:—

Serial No.	Name.	Date of Inoculation.	Date of Attack.	Date of Death.	Remarks.
1	Thawar Megji	5.5.98	10.5.98	—	Occupied one ground-floor tenement.
2	Mulbai Megji	5.5.98	10.5.98	—	
3	Gulu Ismail	9.5.98	—	—	Occupied one ground-floor tenement.
4	Rakhia Musa	5.5.98	17.5.98	—	
5	Kesarbai Gulu	(Not inoculated.)	—	—	
6	Shiva Jiwraj	6.5.98	17.5.98	—	Occupied one ground-floor tenement.
7	Basria Ladha	9.5.98	—	—	Occupied the upper two stories of the house.
8	Miriam Basria	5.5.98	—	—	
9	Jana Meher Ali	9.5.98	—	—	
10	Bhanbai Basria	9.5.98	—	—	
11	Kanji Basria	5.5.98	—	—	
12	Ali Musa	5.5.98	—	—	
13	Nathu Musa	5.5.98	—	—	
14	Meher Ali Ladha	9.5.98	—	—	
15	Nenbai Ladha	(Not inoculated.)	18.5.98	18.5.98	

There is another notable instance of a number of cases occurring among the inoculated shown in Forms Nos. 33, 34, and 35 on plot No. 515, E—4, Gopal Street Ranchor Quarter. This is a two-storied tenement house, with a yard in the centre, open to the sky. There are five tenements on the first floor and five on the ground-floor. Pirbhu Punjah, shown in Form No. 33, was residing with two other inoculated persons in a tenement on the first floor. He was attacked 56 days after inoculation and died.

Manbai Bechar, shown in Form No. 34, was residing with two others in a ground-floor tenement. She was attacked 67 days after inoculation and died.

Dewlibai Sundar, Laxman Hari, and Sundar Hari, shown in Form No. 35, were occupying a tenement on the first floor and a tenement on the ground floor between them. They are closely related to one another. Dewlibai was attacked 68 days, Laxman Hari 61 days, and Sundar Hari 66 days after inoculation. Out of the three, Laxman only recovered. On the occurrence of the first case the house was evacuated, and those that were inoculated were sent to a health camp, the rest being segregated. Manbai, Dewlibai and Laxman were attacked in the health camp. Sundar Hari, who was segregated on the occurrence of these cases, was attacked in the Lawrence Road Segregation Camp.

The following statement gives full particulars:—

Serial No.	Name.	Date of Inoculation.	Date of Attack.	Date of Death.	Remarks.
1	Tulsi Punjah	19.5.98	—	—	Occupied one tenement on first floor.
2	Pirbhu Punjah	21.5.98	16.7.98	17.7.98	
3	Dalu Govind	21.5.98	—	—	
4	Kustur Madowji.	12.5.98	—	—	Occupied one tenement on first floor.
5	Manbai Kustur	(Not inoculated.)	—	—	
6	Chichi Kustur	"	—	—	
7	Dewlibai Sundar.	12.5.98	19.7.98	20.7.98	Occupied one tenement on first floor and one tenement on ground-floor between them.
8	Laxman Hari	21.5.98	21.7.98	—	
9	Sundar Hari	21.5.98	26.7.98	2.8.98	
10	Daya Madowji	11.5.98	—	—	Occupied two adjoining tenements on the first floor.
11	Lowji Daya	12.5.98	—	—	
12	Lukmichand Daya.	12.5.98	—	—	
13	Manubai Daya	12.5.98	—	—	
14	Umbabai Daya	12.5.98	—	—	
15	Tribhowan Bechar.	12.5.98	—	—	Occupied one ground-floor tenement.
16	Jivibai Tribhowan.	12.5.98	—	—	
17	Manbai Bechar	12.5.98	18.7.98	28.7.98	
18	Manji Rura	21.5.98	—	—	Occupied one ground-floor tenement.
19	Mungibai Moti	12.5.98	—	—	
20	Pitambar Narsu	12.5.98	—	—	Occupied one ground-floor tenement.
21	Dewlibai Pitambar.	12.5.98	—	—	
22	Poha Pitambar	(Not inoculated.)	—	—	
23	Shivji Daya	19.5.98	—	—	Occupied one ground-floor tenement.
24	Ranbai Shivji	12.5.98	—	—	

Thus, out of a total population of 24 persons residing on Plot No. 515 E—4, Gopal Street, Ranchor Quarter, 21 were inoculated. Among these, five cases with four deaths occurred. All the three uninoculated escaped. To consider inoculation on its own merits, the bare fact of the occurrence of plague among the inoculated has only been given; all collateral considerations have been excluded, such as the virulence of the epidemic at the time of occurrence of plague cases among the inoculated Khojas shown in Forms 3, 8, and 11, as well as in other forms, in the Machi Miani Quarter, and the lingering of the disease among only one sect of Hindu-Katchi carpenters of the Ranchor Quarter, shown in Forms 33, 34, and 35.

The information regarding the occurrence of plague among the uninoculated residing in houses where the inmates had subjected themselves to the operation does not appear to be complete.

No useful information in connection with inoculation has been furnished by the different Plague Superintendents, with the exception of the Superintendent of the Market and Jail Quarters, Lieutenant Anderson. This officer, in his letter, No. 170, dated 19th August

last, to the address of the President, Plague Committee, makes a reference about inoculation as follows:—

"Among the coolies of the disinfecting gangs, the results were wonderfully good. Previous to 5th May, 20 cases of plague occurred among these men, who had been working at a daily strength of 50–55; on 5th May, 25 coolies and masons were inoculated by Dr. Kaka at the Khoja Khana, and on 12th May the remaining 31 were also inoculated. Of these, one man developed high fever within the next 24 hours (*vide* Form No. 2), a bubo appearing on the third day; on the fifth day he was removed to hospital, where he died immediately after admission. With this exception there has been no case of plague among the coolies, and this man must have been in the incubation stage of the disease at the time of his inoculation. As these men had to work all day in most highly infected houses in the most highly infected quarters, the result appears exceedingly good."

Out of 44 cases with 25 deaths occurring among the inoculated up to the week ending 12th August 1898, 14 cases with 10 deaths occurred within the first 10 days of inoculation.

The 287 persons twice inoculated have had not a single case of plague reported among them.

Appendix A. gives the names of all inoculated persons who developed plague, with other particulars.

The following statement gives the weekly number of plague cases and deaths among the inoculated from the week ending 13th May to the week ending 12th August 1898. The first of the 44 cases among the inoculated took ill on May 5th, and the last on 10th August 1898. The three cases which occurred during the week ending 21st October 1898 have been excluded:—

Week ending	Cases.			Deaths.		
	Males.	Females.	Total.	Males.	Females.	Total.
13 May 1898 -	3	3	6	2	—	2
20 „ „ -	7	4	11	3	2	5
27 „ „ -	2	—	2	2	1	3
3 June „ -	3	4	7	2	2	4
10 „ „ -	—	1	1	—	2	2
17 „ „ -	5	—	5	—	—	—
24 „ „ -	2	—	2	1	—	1
1 July „ -	1	—	1	—	—	—
8 „ „ -	—	—	—	—	—	—
15 „ „ -	—	—	—	—	—	—
22 „ „ -	2	2	4	1	1	2
29 „ „ -	2	—	2	—	1	1
5 Aug. „ -	2	—	2	4	—	4
12 „ „ -	—	1	1	—	1	1
Total -	29	15	44	15	10	25

It is, however, the Khojas who afford striking illustration of the efficacy of inoculation.

Primarily, it may be stated that in Karachi there are two different sects of Khojas—the Panjabhai party, believing in H. H. Aga Khan, C.I.E., and the Pirai party, who do not recognise the Aga as their spiritual head. The former, under instructions from H. H. Aga Khan, came forward early in the epidemic to be inoculated, and, as stated above, the operations were commenced among them on 25th April, and terminated on 30th June 1898. The following statement shows the weekly number of inoculated Khojas of the Panjabhai party commencing from the week ending 29th April to the week ending 1st July 1898:—

Week ending	Males.	Females.	Total.
29 April 1898 - - -	16	—	16
6 May „ - - -	317	299	616
13 „ „ - - -	444	246	693
20 „ „ - - -	122	182	304
27 „ „ - - -	56	81	137
3 June „ - - -	33	13	46
10 „ „ - - -	18	33	51
17 „ „ - - -	18	11	29
24 „ „ - - -	2	—	2
1 July „ - - -	5	2	7
Total - -	1,031	867	1,898

The following statement shows the Panjabhai inoculated Khojas, classified according to age groups:—

Caste.	1–4.		5–14.		15–24.		25–54.		55 and upwards.		Total.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
Khojas inoculated - - -	88	80	310	293	213	158	362	301	58	30	1,031	867

A census of this sect of the Khojas taken in August 1898 showed the total population, including deaths only from plague, and excluding deaths from all other causes, to be 2,326, comprising 1,242 males and 1,084 females; *i.e.*, excluding 1,031 males and 867 females, who were inoculated, the uninoculated population was 211 males and 217 females, or a total of 428.

The average annual mortality among all the Khojas of Karachi, excluding mortality in the year 1896-97, when plague was prevalent in the city, is 78. This figure is arrived at as under:—

Mortality during 1892-93 = 87
„ „ 1893-94 = 64
„ „ 1894-95 = 67
„ „ 1895-96 = 94
4)312
78

The average total mortality of the city for the four years ending 1895–96 is 33 per 1,000.

Assuming that all the Khojas of Karachi died on the average at the rate of 30 per 1,000, the total population of this community would come up to 2,600.

The Pirai party, who do not believe in the Aga, numbered during the plague 245 souls, so that the enumerated population of 2,326 among the Panjabhai Khojas is fairly correct. The total number of cases and deaths that occurred among the inoculated Panjabhai Khojas was 20 (9 males and 11 females) and 9 (4 males and 5 females) respectively. Three cases, reported during the week ending 21st October 1898, have occurred five months after inoculation. These are not taken into account, and are excluded from the 1,898 inoculated persons and added to the 428 uninoculated.

Thus, the 1,895 inoculated had 17 cases and 9 deaths commencing from the week ending 6th May to the week ending 10th June 1898, giving a total mortality of 0·47 and a case mortality of 52 per cent. The 431 uninoculated Panjabhai Khojas had 37 cases (20 males and 17 females) and 28 deaths (16 males and 12 females) commencing from the week ending 25th April to the

week ending 3rd June 1898, giving a total mortality of 6·4 per cent. and a case mortality of 75 per cent.

Calculated upon the mortality among the uninoculated, the 1,895 inoculated should have had 123 deaths and not 9, which is a difference in the mortality of 77 per cent. Out of 20 cases and 9 deaths that occurred among the Panjabhai Khojas, 8 cases and 5 deaths took place within the first 10 days of inoculation.

The first case of plague among the inoculated was reported on the 5th May and the last on 3rd June; the first case of plague among the uninoculated was reported on 23rd April and the last on 1st June 1898.

Appendix B. gives the names of the inoculated Panjabhai Khojas who developed plague, with other particulars.

Appendix C. gives the names of the uninoculated Panjabhai Khojas who developed plague, with other particulars.

The following statement gives the weekly number of cases and deaths among the inoculated Khojas of this sect:—

Week ending	Cases.			Deaths.		
	Males.	Females.	Total.	Males.	Females.	Total.
6th May 1898 -	1	—	1	—	—	—
13th „ „ -	1	3	4	1	—	1
20th „ „ -	4	3	7	3	2	5
27th „ „ -	—	—	—	—	—	—
3rd June „ -	1	4	5	—	2	2
10th „ „ -	—	—	—	—	1	1
Total -	7	10	17	4	5	9

The following statement gives the weekly number of cases and deaths among the uninoculated Khojas of the Panjabhai party:—

Week ending	Cases.			Deaths.		
	Males.	Females.	Total.	Males.	Females.	Total.
29th April 1898 -	4	4	8	—	2	2
6th May „ -	8	8	16	8	6	14
13th „ „ -	1	3	4	2	1	3
20th „ „ -	5	1	6	4	2	6
27th „ „ -	—	1	1	—	—	—
3rd June „ -	2	—	2	2	—	2
10th „ „ -	—	—	—	—	1	1
Total -	20	17	37	16	12	28

Taking, again, the Pirai party of Khojas, this community comprised 245 sculs, excluding those who died from all other causes than plague. Out of these, only 4 (3 males and 1 female) were inoculated. The 241 Pirai Khojas, comprising 130 males and 111 females, had 14 cases with 13 deaths from plague. Here, the total mortality comes up to 5·3 per cent. and the case mortality to 92 per cent. No case of plague was reported from the inoculated Pirai Khojas. The first case of plague from the Pirai Khojas occurred on 23rd April and the last on 18th May 1898.

The following statement gives the weekly number of plague cases and deaths among the uninoculated Khojas of this sect:—

Week ending	Cases.			Deaths.		
	Males.	Females.	Total.	Males.	Females.	Total.
29th April 1898 -	1	1	2	—	—	—
6th May „ -	2	3	5	3	3	6
13th „ „ -	1	2	3	1	2	3
20th „ „ -	3	1	4	2	1	3
27th „ „ -	—	—	—	1	—	1
Total -	7	7	14	7	6	13

All the cases and deaths from plague that occurred among the inoculated and uninoculated Panjabhai Khojas and among the uninoculated Pirai Khojas have been shown in this report.

During the prevalence of the epidemic, every case of sickness was notified, and with the perfect system of registration of deaths in force for some considerable time in the city, it is not likely that any case of sickness or death from plague escaped notice.

Appendix D. gives the names of the Pirai uninoculated Khojas who developed plague, with other particulars.

The following statement gives the number of inoculated and uninoculated Panjabhai Khojas, with the number of plague cases and deaths among them, classified according to quarters:—

Quarters.	Number of Panjabhai Khojas Inoculated.	Number of Plague Cases.	Number of Plague Deaths.	Number of Panjabhai Khojas Un-inoculated.	Number of Plague Cases.	Number of Plague Deaths.
Old Town -	52	—	—	11	4	2
Napier - -	58	—	—	23	8	7
Machi Miani -	805	13	7	81	18	13
Market - -	13	—	—	—	—	—
Lyari - -	206	3	1	36	4	3
Rambagh -	18	—	—	—	—	—
Jail - -	8	—	—	—	—	—
Garden - -	728*	1†	1	282‡	3	3
Ranchor - -	1	—	—	—	—	—
Sadar Bazaar -	2	—	—	—	—	—
Bandar - -	4	—	—	—	—	—
Total -	1,898	17	9	430	37	28

* Excluding three attacked during week ending 21st October 1898.

† Excluding three Khojas who were attacked during week ending 21st October 1898.

‡ Including three inoculated who were attacked five months after inoculation.

Taking, again, the Machi Miani Quarter, which may be practically said to be the head-quarters of the Khoja community, the 805 inoculated Panjabhai Khojas had 13 cases and 7 deaths, *i.e.*, a total mortality 0·8 per cent. and a case mortality 53 per cent. The 81 uninoculated had 18 cases and 13 deaths, *i.e.*, a total mortality 16 per cent. and a case mortality 72 per cent. Calculated upon the mortality among the uninoculated the 805 inoculated should have had 129 deaths and not 7, which is a difference in the mortality of 90 per cent.

The Machi Miani Quarter was one of the badly infected districts of the city, and had to be evacuated of all its inhabitants together with the other adjoining infected quarters under orders of the District Magistrate, subsequently modified in favour of only those families or houses all the members of which had been inoculated. The Khojas, as stated above, chiefly reside in this quarter, and as the majority of them had been inoculated they were permitted to remain in their houses. The notice of the District Magistrate ordered evacuation on 15th May 1898.

The result, therefore, among the inoculated Khojas, who were residing in a very highly infected quarter of the city, is eminently satisfactory.

In concluding this report, it must be said that the persons inoculated were not watched for the reaction.

S. M. KAKA, D.P.H. (London),
Health Officer, Karachi Municipality.

Municipal Office, Karachi,
6th December 1898.

STATEMENTS, No. 1 to No. 56, of OCCURRENCES of PLAGUE in HOUSES inhabited by PERSONS inoculated against the PLAGUE.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Disease, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	1.	
Plot No. 4 I-4, His Highness Agar Khan's garden, Government Garden Lane, Garden Quarter.	*Muhammad Rhymtula, male, 18 years, inoculated on 5th May 1898. *Muhammad Rhymtula was attacked on 5th May 1898 and die on the 7th idem in his house. Caste—Musalman, Khoja. Occupation—Dealer in tallow. Birthplace—Karachi. General health—No record.	Menenbai Rhymtula, female, 46 years. Valbai Meher Ali, female, 40 years. Sakina Muhammad, female, 18 years. Bana Muhammad, male, 1 year.
	2.	
Bagdadi, Lyari Quarter -	*Mowladad Shah Dost, male, 30 years, inoculated on 5th May 1898. *Mowladad was attacked on 5th May 1898 and died on the 10th idem in the Lyari Sick Camp. Caste—Musalman, Makrani. Occupation—Coolie (Plague Gang). Birthplace—Makran. General health.—No record.	
	3.	
Plot No. 74 A-12, Chandumal Lane, Machi Miani Quarter.	*Thawar Megji, male, 19 years, inoculated on 5th May 1898. †Mulbai Thawar, female, 13 years, inoculated on 5th May 1898. *Thawar was attacked on 10th May 1898; bubo in left groin; disease mild; discharged cured from Khoja Hospital on 1st June 1898. †Malbai was attacked on 10th May 1898; disease mild; discharged cured from Khoja Hospital on 1st June 1898. Caste of both—Musalman, Khoja. Occupation of Thawar—Broker. Birthplace of both—Karachi. Present address—Plot No. 22 A-11, Muhammad Ali Makhi Street, Machi Miani Quarter. General health—No record.	
	4.	
Plot No. 42 A-12, Imamwara Street, Machi Miani Quarter.	Gul Shukar Fazul, female, 45 years, inoculated on 5th May 1898. Musiani Fazul, female, 15 years, inoculated on 5th May 1898. Zenub Fazul, female, 11 years, inoculated on 5th May 1898. Vali Muhammad Fazul, male, 22 years, inoculated on 5th May 1898. Fazul Lalu, male, 80 years, inoculated on 9th May 1898. Jafar Alana, male, 60 years, inoculated on 9th May 1898. *Ranbai Jafar, female, 50 years, inoculated on 5th May 1898. *Ranbai was attacked on 10th May 1898; no visible glandular enlargements; brain symptoms pronounced; died in Khoja Hospital on 15th May 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. General health—No record.	

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	5.	
Plot No. 94 C-2, Rhymtula Street, Machi Miani Quarter.	*Ratanbai Piru, female, 12 years, inoculated on 6th May 1898. Alina Vali, male, 32 years, inoculated on 6th May 1898. Rahima Alina, female, 22 years, inoculated on 6th May 1898. Piru Khaku, male, 60 years, inoculated on 6th May 1898. Ali Piru, male, 16 years, inoculated on 6th May 1898. *Ratanbai was attacked on 13th May 1898; bubo left groin; had measles on 20th May; died in Khoja Hospital on 31st May 1898. The woman was said to be suffering from a chronic ailment of some 10 month's duration. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. General health—No record.	Sukina Alina, female, 4 years. Miriam Alina, female, 2 years. Rani, wife of Piru, female, 45 years.
	6.	
Plot No. 28 A-12, Pahria Street, Machi Miani Quarter.	Mitha Abji, male, 80 years, inoculated on 4th May 1898. Aladin Mitha, male, 30 years, inoculated on 10th May 1898. Mamu Mitha, male, 25 years, inoculated on 5th May 1898. Husein Mitha, male, 20 years, inoculated on 9th May 1898. Muhammad Aladin, male, 10 years, inoculated on 11th May 1898. Jafar Aladin, male, 7 years, inoculated on 11th May 1898. Haji Aladin, male, 3 years, inoculated on 11th May 1898. Naout Aladin, female, 28 years, inoculated on 5th May 1898. *Begum Mitha, female, 50 years, inoculated on 5th May 1898. Ramzan Ismail, male, 66 years, inoculated on 4th May 1898. Zena Ramzan, female, 60 years, inoculated on 9th May 1898. Rhymtula Ramzan, male, 40 years, inoculated on 3rd May 1898. Rhymatbai Rhymtula, female, 8 years, inoculated on 3rd May 1898. Teja Ramzan, male, 37 years, inoculated on 5th May 1898. Sultan Teja, female, 16 years, inoculated on 5th May 1898. Miriam Teja, female, 6 years, inoculated on 4th May 1898. Muhammad Teja, male, 4 years, inoculated on 4th May 1898. Datu Ramzan, male, 34 years, inoculated on 3rd May 1898. Shiran Datu, female, 26 years, inoculated on 5th May 1898. Nathi Datu, female, 8 years, inoculated on 5th May 1898. Shahban Datu, male, 6 years, inoculated on 5th May 1898. Nazor Ali Ramzan, male, 35 years, inoculated on 3rd May 1898. Satkina Nazar Ali, female, 25 years, inoculated on 5th May 1898. Khatijan Nazar Ali, female, 12 years, inoculated on 5th May 1898. Sabz Ali Ramzan, male, 25 years, inoculated on 3rd May 1898. Fatma Sabz Ali, female, 18 years, inoculated on 5th May 1898. *Begum Mitha was attacked on 14th May 1898; no visible glandular enlargements; brain symptoms pronounced; died in Khoja Hospital on 17th May 1898. The deceased was said to have been inoculated in Bombay some three-and-a-half months before her inoculation in Karachi.	Husan, Teja, male, 12 months. Zenub Rhymtula, female, 30 years.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	6—*cont.* Jafar Ramzan, male, 18 years, inoculated on 6th May 1898. Zena Piru, female, 28 years, inoculated on 9th May 1898. Muhammad Musa, male, 65 years, inoculated on 5th May 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Katch. General health—No record.	
Plot No. 86 C–2, Musa Street, Machi Miani Quarter.	**7.** *Musa Mowji, male, 30 years, inoculated on 5th May 1898. Jiva Megha, male, 25 years, inoculated on 5th May 1898. Sakina Jiva, female, 20 years, inoculated on 5th May 1898. * Musa Mowji was attacked on 15th May 1898; buboes in right groin and left axilla; died in Khoja Hospital on the 19th idem. Caste—Musalman, Khoja. Occupation—Bullock-cart driver. Birthplace—Katch. General health—No record.	
Plot No. 74 A–12, Chandumal Street, Machi Miani Quarter.	**8.** Galu Ismail, male, 30 years, inoculated on 9th May 1898. *Rakhia Musa, female, 7 years, inoculated on 5th May 1898. * Rakhia was attacked on the 17th May 1398; bubo on the right side of the neck; disease generally mild; discharged cured from Khoja Hospital on 9th June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. Present address—Plot No. 74 A–12, Chandumal Street, Machi Miani Quarter. General health—No record.	Kesarbai Gulu, female, 30 years.
Plot No. 22 A–11, Muhammad Ali Mukhi Lane. Machi Miani Quarter.	**9.** *Muhammad Meghji, male, 6 years, inoculated on 5th May 1898. Ghulam Husein, male, 7 years, inoculated on 7th May 1898. * Muhammad was attacked on 17th May 1898; bubo on the left side of the neck; died in Khoja Hospital on 20th May 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. General health—No record.	Natha Meghji, male, 25 years. Meher Ali Natha, male, 1½ years. Bachu Elaya, male, 25 years.
Plot No. 57 A–12, Imamwara Street, Machi Miani Quarter.	**10.** Jafar Ghulam, male, 28 years, inoculated on 5th May 1898. Rhymtula Jafar, male, 2 years, inoculated on 5th May 1898. Fiji Datu, female, 3 years, inoculated on 5th May 1898. Rahima Datu, male, 4 years, inoculated on 5th May 1898. Abdula Murad Ali, male, 3 years, inoculated on 5th May 1898. Mari Murad Ali, female, 18 years, inoculated on 5th May 1898. Suleman Datu, male, 13 years, inoculated on 5th May 1898. Muhammad Datu, male, 10 years, inoculated on 4th May 1898.	Sakina Murad Ali, female, 1½ years.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	10—*cont.* Chagla Vali, male, 10 years, inoculated on 5th May 1898. Zenub Vali, female, 5 years, inoculated on 4th May 1898. Zenub Datu, female, 12 years, inoculated on 4th May 1898. Khatu Shahban, female, 5 years, inoculated on 5th May 1898. *Kasim Vali, male, 12 years, inoculated on 3rd May 1898. Thakrani Vali, female, 30 years, inoculated on 10th May 1898. Fatima Jafar, female, 24 years, inoculated on 5th May 1898. Sakina Shahban, female, 28 years, inoculated on 5th May 1898. Zenub Datu, female, 22 years, inoculated on 5th May 1898. Shahban Datu, male, 28 years, inoculated on 9th May 1898. Bana Datu, male, 17 years, inoculated on 9th May 1898. * Kasim Vali was attacked on the 17th May 1898; bubo on left side of neck; disease mild; discharged cured from Khoja Hospital on 6th June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. Present address—Plot No. 57 A-12, Imamwara Street, Machi Miani Quarter. General health—No record.	
Plot No. 74 A-12, Chandumal Street, Machi Miani Quarter.	**11.** *Sheva Jivraj, male, 50 years, inoculated on 6th May 1898. * Sheva Jivraj, was attacked on the 17th May 1898, and died in Khoja Hospital on the 19th idem. Caste—Musalman, Khoja. Occupation—Bullock-cart driver. Birthplace—Katch. General health—No record.	
Nasarpuri Camp, Lyari Quarter.	**12.** *Teja Mula, male, 12 years, inoculated on 14th May 1898. Okar Mula, male, 5 years, inoculated on 14th May 1898. Reva Mula, male, 8 years, inoculated on 14th May 1898. * Teja was attacked on 17th May 1898; bubo left groin; symptoms pronounced; died on 25th May 1898 in Vishindas Hospital. Caste—Hindu, Nasarpuri. Occupation—Nil. Birthplace—Karachi. General health—No record.	Mula Hunda, male, 34 years. Chati Mula, female, 26 years.
Plot No. 117 C-1, Rhymtula Street, Machi Miani Quarter.	**13.** Esa Nensi, male, 60 years, inoculated on 5th May 1898. Janabai Esa, female, 50 years, inoculated on 9th May 1898. Gulu Esa, male, 20 years, inoculated on 10th May 1898. Alu Esa, male, 25 years, inoculated on 6th May 1898. Vali Esa, male, 18 years, inoculated on 7th May 1898. Mamu Esa, male, 10 years, inoculated on 18th May 1898. Dhana Esa, female, 8 years, inoculated on 6th May 1898.	

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated* ; Date of Onset of Disease, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated* ; Date of Onset of Disease, Symptoms, Issue.
	13—*cont.* Karmi Esa, male, 12 years, inoculated on 9th May 1898. Musa Esa, male, 6 years, inoculated on 10th May 1898. *Ratanbai Haji, female, 22 years, inoculated on 9th May 1898. * Ratanbai was attacked on 18th May 1898; very mild case; discharged cured from Khoja Hospital on 1st June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. Present address—Plot No. 117 C-1, Rhymtula Street, Machi Miani Quarter. General health—No record.	
Messrs. Graham & Co.'s Huts, Queen's Road Quarter.	**14.** *Vela Teja, male, 17 years, inoculated on 3rd May 1898. Teju Deva, male, 50 years, inoculated on 3rd May 1898. Daya Jetha, male, 22 years, inoculated on 3rd May 1898. * Vela Teja was attacked on 20th May 1898; extremely mild case; bubo in right groin; discharged cured from Vishindas Hospital on 2nd June 1898. Caste—Meghwar (other castes). Occupation—Coolie in Bone Mill. Birthplace—Katch. Present address—Plot No. 6 A-30, River Road, Napier Quarter. General health—No record.	
Plot No. 25 A-12, Ghulam, Husein Street, Machi Miani Quarter.	**15.** *Ranbai Yakub, female, 45 years, inoculated on 17th May 1898. * Ranbai was attacked on 20th May 1898; bubo left groin; died on the 25th idem in her house. Caste—Musalman, Summa. Occupation—Nil. Birthplace—Katch. General health—No record.	
Plot No. 21 G B-21, Hasan Ali Street, Serai Quarter.	**16.** *Raghu Pandu, male, 35 years, inoculated on 20th May 1898. * Raghu was attacked on 22nd May 1898; bubo left groin; died in Civil Hospital on the 26th idem. Caste—Hindu, Mahratta. Occupation—Mechanical engineer. Birthplace—Malvan. General health—No record.	
Plot No. 93 G-1, Somerset Street, Sadar Bazaar Quarter.	**17.** *Kakumal Mulchand, male, 12 years, inoculated on 19th May 1898. Gangulbai Mulchand, female, 10 years, inoculated on 19th May 1898. †Tolaram Bhojraj, male, 10 years, inoculated on 19th May 1898. * Kakumal was attacked on 19th May 1898; bubo in right groin; died in house on the 28th idem. † Tolaram Bhojraj was attacked in the Lawrence Road Segregation Camp on 31st May 1898; bubo in left groin; discharged cured from Civil Hospital on 22nd June 1898.	Methbai Mulchand, female, 36 years. Mulchand Gopaldas, male, 45 years. Akhund Bhojraj, female, 35 years.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack, with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Disease, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	17—*cont.* Caste of both—Hindu, Khudabadi. Occupation of both—Nil. Birthplace of both—Karachi. Present address of Tolaram—Hyderabad, Sind. General health of both—No record.	
	18.	
Plot No. 22, C-6, Bandar Road Market Quarter.	*Devji Narayan, male, 12 years, inoculated on 11th May 1898. Hansraj Narayan, male, 10 years, inoculated on 11th May 1898. Jairam Narayan, male, 7 years, inoculated on 11th May 1898. Vishram Narayan, male, 13 years, inoculated on 21st May 1898. Balu Dhana, male, 26 years, inoculated on 21st May 1898. * Devji was attacked on the 27th May 1898; was removed to Plot No. 163 E-4, Sweepers' Village Street, Ranchor Quarter, where he died on 30th May 1898. Caste—Hindu, Katchi Halai. Occupation—Nil. Birthplace—Karachi. General health—No record.	Narayan Dharamsi, male, 40 years.
	19.	
Plot No. 53 A-12, Nasar Street, Machi Miani Quarter.	*Virbai Pesun, female, 35 years, inoculated on 6th May 1898. Pesun Hashim, male, 55 years, inoculated on 5th May 1898. Parpai Hashim, female, 65 years, inoculated on 9th May 1898. *Virbai was attacked on 28th May 1898; symptoms mild; bubo in right axilla; discharged cured from Khoja Hospital on 20th June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthpalace—Karachi. Present address—Plot No. 18 A-12, Rampart Road, Machi Miani Quarter. General health—No record.	
	20.	
Miran Pir, Lyari Quarter -	*Daulat Gulu, female, 3 years, inoculated on 5th May 1898. Taki Pirana, male, 2 years, inoculated on 6th May 1898. Muhammad Pirana, male, 6 years, inoculated on 5th May 1898. Thaun Sabz Ali, female, 15 years, inoculated on 9th May 1898. Laung Pirana, male, 10 years, inoculated on 5th May 1898. Jiand Pirana, female, 8 years, inoculated on 6th May 1898. Pirana Sabz Ali, male, 35 years, inoculated on 9th May 1898. Fatma Pirana, female, 35 years, inoculated on 9th May 1898. Shakar Gulu, female, 8 years, inoculated on 5th May 1898. Kursan Sabz Ali, female, 11 years, inoculated on 5th May 1898. Gulu Sabz Ali, male, 25 years, inoculated on 5th May 1898. Juma Sabz Ali, male, 22 years, inoculated on 5th May 1898. *Daulat was attacked on 1st June 1898; bubo on right side of neck; died in Khoja Hospital on 3rd June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. General health—No record.	Husein Pirana, male, 1½ years. *Datu Chakra, male, 42 years. * Datu was attacked on 31st June 1898; bubo in right groin; died in Khoja Hospital on 1st June 1898.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack, with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Disease, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	21.	
Plot No. 40 A–12, Imamwara Street, Machi Miani Quarter.	*Thakrani Kulfan, female, 60 years, inoculated on 9th May 1898. Kumbar Kulfan, male, 20 years, inoculated on 5th May 1898. Kudar Kulfan, male, 25 years, inoculated on 3rd May 1898. Ismail Mohbat, male, 70 years, inoculated on 9th May 1898. Muhammad Ghulam Husein, male, 25 years, inoculated on 5th May 1898. Phapu Ghulam Husein, female, 40 years, inoculated on 9th May 1898. Thakrani Muhammad, female, 15 years, inoculated on 5th May 1898. Meher Ali Ghulum, male, 25 years, inoculated on 9th May 1898. Asur Meher Ali, male, 4 years, inoculated on 5th May 1898. Alu Ghulam, male, 8 years, inoculated on 8th May 1898. Mumma Meher Ali, female, 21 years, inoculated on 6th May 1898. Bana Ghulam, male, 7 years, inoculated on 7th May 1898. * Thakrani Kulfan was attacked on 2nd June 1898; symptoms pronounced; bubo in right axilla; died in Khoja Hospital on 4th June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. General Health—No record.	
	22.	
Miran Pir, Lyari Quarter	*Alina Khatao, male, 15 years, inoculated on 9th May 1898. Khatao Alu, male, 40 years, inoculated on 9th May 1898. Pudhabai Khatao, female, 27 years, inoculated on 11th May 1898. Vali Khatao, male, 14 years, inoculated on 12th May 1898. Ghulam Husein Khato, male, 10 years, inoculated on 7th May 1898. Dowli Khatao, female, 4 years, inoculated on 7th May 1898. * Alina was attacked on 3rd June 1898; symptoms mild; bubo in right groin; discharged cured from Khoja Hospital on 20th June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. Present address—Miran Pir, Lyari Quarter. General health—No record.	Jena Khatao, female, 7 years. Nur Muhammad Khatao, male, 6 months.
	23.	
Miran Pir, Lyari Quarter	*Karamsi Muhammad, female, 22 years, inoculated on 6th May 1898. Alahrakhia Alina, male, 45 years, inoculated on 9th May 1898. Sakina Alahrakhia, female, 25 years, inoculated on 5th May 1898. Kadu Alahrakhia, male, 24 years, inoculated on 5th May 1898. * Karamsi was attacked on 3rd June 1898; bubo in right groin; discharged cured from Khoja Hospital on 20th June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. Present address—Miran Pir, Lyari Quarter. General health—No record.	

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Disease, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	24.	
Plot No. 265 P T, Port Trust Lines, Keamari Quarter.	*Jadu Bana, male, 19 years, inoculated on 28th May 1898. * Jadu took ill on 3rd June 1898; bubo left groin; discharged cured from Manora Hospital on 5th July 1898. Caste—Hindu, Surti. Occupation—General servant. Birthplace.—Surat. Present address—Said to have left Karachi. General Health—No record.	
	25.	
Plot No. 519 E-4, Gopal Street, Ranchor Quarter.	*Manki Daya, female, 10 years, inoculated on 19th May 1898. Daya Amidas, male, 40 years, inoculated on 19th May 1898. Megibai Daya, female, 35 years, inoculated on 19th May 1898. Hemibai Daya, female, 11 years, inoculated on 19th May 1898. * Manki was attacked on 6th June 1898; symptoms pronounced; bubo in right groin; died in Dufferin Hospital on 10th June 1898. Caste—Hindu, Bania. Occupation—Nil. Birthplace—Kathiawar. General health.—No record.	Mani Daya, female, 2 years.
	26.	
Plot No. 6 B-14, Narayan Street, Serai Quarter.	*Dhondi Bhawan, male, 40 years, inoculated on 23rd May 1898. Gopal Dhondi, male, 10 years, inoculated on 23rd May 1898. Hari Dhondi, male, 9 years, inoculated on 23rd May 1898. Amabai Dhondi, female, 5 years, inoculated on 23rd May 1898. †Govind Dhondi, male, 12 years, inoculated on 23rd May 1898. * Dhondi Bhawan was attacked on 11th June 1898; bubo in left groin; died in Vishindas Hospital on 18th June 1898. † Govind Dhondi was attacked on 13th June 1898; symptoms severe; bubo in right groin; discharged cured from Vishindas Hospital on 17th July 1898. Caste of both—Hindu, Mahratta. Occupation of Dhondi—Compositor. ,, Govind—Nil. Birthplace of both—Karachi. Present address of Govind—Plot No. 21 B-21, Hasan Ali Street, Serai Quarter. General health—No record.	Raghubai Dhondi, female, 30 years. Parubai Bhawan, ,, 60 ,,
	27.	
Amri Tank, Trans-Lyari -	*Rewachand Ratanbhand, male, 25 years, inoculated on 7th May 1898. Mulchand Govardhandas, male, 25 years, inoculated on 12th May 1898. Narsingdas Chelaram, male, 25 years, inoculated on 14th May 1898. * Rewachand was attacked on 13th June 1898; bubo in right groin; symptoms mild; discharged cured from Vishindas Hospital on 27th June 1898. Caste—Hindu, Sarsud Brahmin. Occupation—Clerk. Birthplace—Karachi. Present address—Plot No. 3 A-6, Naomal Street, Old Town Quarter. General health—No record.	

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated;* Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated;* Date of Onset of Disease, Symptoms, Issue.
	28.	
Plot No. 23 G-1, Grain Market, Sadar Bazaar Quarter.	*Bherumal Valiram, male, 22 years, inoculated on 27th May 1898. * Bherumal was attacked on 15th June 1898; bubo in left groin; discharged cured from Vishindas Hospital on 14th July 1898. Caste—Hindu, Lohana. Occuaption—Milk-seller. Birthplace—Kandiaro, Hyderabad District. Present address— „ „ General health—No record.	Udhavsing Thavarsing, male, 55 years.
	29.	
Plot No. 198 G-1, Clerk Street, Sadar Bazaar Quarter.	*Mulji Dhulu, male, 70 years, inoculated on 4th June 1898. Daya Mulji, male, 32 years, inoculated on 6th June 1898. Thakrubai Daya, female, 18 years, inoculated on 6th June 1898. * Mulji Dhulu was attacked on 17th June 1898; bubo in right groin; symptoms mild; discharged cured from Vishindas Hospital on 11th July 1898. Caste—Hindu, Soni. Occupation—Goldsmith. Birthplace—Viramgam. Present address—Plot No. 198 G-1, Clerk Street, Sadar Bazaar Quarter. General health—No record.	Infant daughter of Daya, under 1 year.
	30.	
Sweepers' Camp, Lyari Quarter.	*Piradita Bola, male, 22 years, inoculated on 6th May 1898. * Piradita was attacked on 20th June 1898; bubo in right groin; discharged cured from Lyari Sick Camp on 10th August 1898. Caste—Sweeper (other Castes). Occupation—Sweeper. Birthplace—Gujranvala, Panjab. Present address—Sweepers' Camp, Lyari Quarter. General health—No record.	Gunda Kana, male, 30 years.
	31.	
Plot No. 38 E-4, Teja Street, Ranchor Quarter.	*Vishram Arjun, male, 30 years, inoculated on 25th May 1898. Jairam Arjun, male, 23 years, inoculated on 25th May 1898. Chaku Manji, male, 20 years, inoculated on 25th May 1898. Jankubai Manji, female, 50 years, inoculated on 25th May 1898. * Vishram took ill on 20th June 1898; bubo in right groin; discharged cured from Civil Hospital on 10th July 1898. Caste—Hindu, Katchi, Lohana. Occupation—Coolie. Birthplace—Rajkot. Present address—Plot No. 19 E-4, Teja Street, Ranchor Quarter. General health—No record.	
	32.	
Sweepers' Camp, Lyari Quarter.	*Bilanda Jamita, male, 22 years, inoculated on 12th May 1898. * Bilanda was attacked on 1st July 1898; had lung symptoms; discharged cured from Lyari Sick Camp on 10th August 1898. Caste—Sweeper (other castes). Occupation—Sweeper. Birthplace—Gujranvala, Panjab. Present address—Sweepers' Camp, Lyari Quarter. *General health—No record.*	Samanda Jamita, male, 20 years. Aladita Bhola, male, 25 years.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	33.	
Plot No. 515 E-4, Gopal Street, Ranchor Quarter.	*Pirbu Punja, male, 23 years, inoculated on 21st May 1898. Dalu Govind, male, 20 years, inoculated on 21st May 1898. Tulsi Punja, male, 32 years, inoculated on 19 May 1898. * Pirbu was attacked on 16th July 1898; bubo in left groin; died in Civil Hospital on the 17th idem. Caste—Hindu, Sutar (carpenter). Occupation—Carpenter. Birthplace—Kathiawar. General health—No record.	
	34.	
Plot No. 515 E-4, Gopal Street, Ranchor Quarter.	*Manbai Bechar, female, 50 years, inoculated on 12th May 1898. Tribhawan Bechar, male, 25 years, inoculated on 12th May 1898. Juri Tribhawan, female, 16 years, inoculated on 12th May 1898. * Manbai was attacked on 18th July 1898; bubo in right groin; died in Civil Hospital on 23rd July 1898. Caste—Hindu, Sutar (carpenter). Occupation—Nil. Birthplace—Katch. General health—No record.	
	35.	
Plot No. 515 E-4, Gopal Street, Ranchor Quarter.	*Devlibai Sundar. female, 20 years, inoculated on 12th May 1898. †Lakshman Hari, male, 25 years, inoculated on 21st May 1898. ‡Sundar Hari, male, 20 years, inoculated on 21st May 1898. * Devlibai was attacked in the Ranchor Health Camp on 19th July 1898; bubo on right side of neck; died in Civil Hospital on 20th July 1898. *Caste—Hindu, Sutar (carpenter). Occupation—Nil. Birthplace—Kathiawar. General health—No record. † Lakshman Hari was attacked in the Ranchor Health Camp on 21st July 1898; bubo in right groin; discharged cured from Civil Hospital on 3rd August 1898. †Caste—Hindu, Sutar (carpenter). Occupation—Carpenter. Birthplace—Kathiawar. Present address—Kathiawar. General health—No record. ‡ Sundar was attacked in the Lawrence Road Segregation Camp on 26th July 1898 and died in Civil Hospital on 2nd August 1898. ‡Caste—Hindu, Sutar (carpenter). Occupation—Carpenter. Birthplace—Kathiawar. General health—No record.	

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	36.	
House No. 115, Gopal Street, Ranchor Quarter.	*Nanchand Bhagwan, male, 28 years, inoculated on 17th May 1898. †Sundar Bhagwan, male, 22 years, inoculated on 21st May 1898. * Nanchand was attacked on 29th July 1898 and died in his house on 30th July 1898. † Sundar was attacked on 4th August 1898, and died in the Lawrence Road Segregation Camp on the 5th idem. Caste of both—Hindu, Katchi. Occupation of both—Mehta (clerk). Birthplace—Saila in Katch. General health—No record.	
	37.	
Plot No. 228 E-1, Bambridge Road, Jail Quarter.	*Ismail Ahmed, male, 25 years, inoculated on 14th May 1898. Heva Ismail, female, 6 years, inoculated on 14th May 1898. * Ismail was attacked on 3rd August 1898; bubo in right groin; and died in his house on the same date. Caste—Musalman, Katchi Memon. Occupation—Sweetmeat-seller. Bsrihplace—Karachi. General health—No record.	Rahima Ismail, female, 20 years.
	38.	
Plot No. 163 E-7, Amba Street, Ranchor Quarter.	*Sunku Valji, female, 8 years, inoculated on 25th May 1898. Bhika Valji, male, 5 years, inoculated on 25th May 1898. Mother of both is also said to be inoculated, but particulars could not be ascertained. * Sunku was attacked on 10th August 1898 and died in her house on the 11th idem. Caste—Hindu, Sutar (carpenter). Occupation—Nil. Birthplace—Karachi. General health—No record.	
	39.	
Dina Datu's garden, Magar Pir Road, Garden Quarter.	Ibrahim Nanji, male, 40 years, inoculated on 20th May 1898. Ladhai Ibraham, female, 18 years, inoculated on 8th May 1898. Jafar Ibraham, male, 8 years, inoculated on 18th May 1898. *Mima Ibrahim, female, 10 years, inoculated on 18th May 1898. * Mima was attacked on 14th October 1898; buboes on left side of neck and left groin; disease mild; discharged cured on 17th November 1898 from Trans-Lyari huts. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. Present address—Dina Datu's garden, Garden Quarter. General health—No record.	Jiwa Ibrahim, female, 35 years. Meha Ali Ibrahim, male, 15 years.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	40.	
Kanji Gowani's garden, Magar Pir Road, Garden Quarter.	Kanji Gowa, male, 40 years, inoculated on 25th May 1898. Virbai Kanji, female, 18 years, inoculated on 17th May 1898. Jafar Kanji, male, 14 years, inoculated on 12th May 1898. Premji Gowa, male, 19 years, inoculated on 17th May 1898. *Moti Premji, male, 19 years, inoculated on 12th May 1898. Chati Premji, female, 10 years, inoculated on 17th May 1898. †Jivraj Gowa, male, 35 years, inoculated on 12th May 1898. Janbai Jivraj, female, 30 years, inoculated on 17th May 1898. Viri Jiwraj, female, 12 years, inoculated on 17th May 1898. Hasi Jivraj, female, 8 years, inoculated on 17th May 1898. * Moti Premji was attacked on 16th October 1898; bubo in right groin; disease mild; discharged cured from Trans-Lyari huts on 17th November 1898. * Caste—Musalman, Khoja. Occupation—Gardener. Birthplace—Karachi. Present address—Kanji Gowani's garden, Garden Quarter. General health—No record. † Jivraj Gowa was attacked on 16th October 1898; bubo in right groin; discharged cured from Trans-Lyari huts on 17th November 1898. † Caste—Musalman, Khoja. Occupation—Gardener. Birthplace—Karachi. Present address—Kanji Gowani's garden, Garden Quarter. General health—No record.	Bara Gowa, female, 80 years. Jiva Premji, female, 40 years. Fatma Premji, female, 1½ years.
	41.	
Plot No. 56 A-12, Imamwara Street, Machi Miani Quarter.	Haji Maku, male, 45 years, inoculated on 6th May 1898. Muhammad Haji, male, 22 years, inoculated on 5th May 1898. Fiji Haji, female, 7 years, inoculated on 6th May 1898. Phapu Haji, female, 6 years, inoculated on 4th May 1898. Zenub Haji, female, 5 years, inoculated on 12th May 1898. Alahrakhia Khaki, male, 22 years, inoculated on 6th May 1898. Rajbai Alahrakhia, female, 18 years, inoculated on 6th May 1898. Ghulam Ali Khaki, male, 16 years, inoculated on 9th May 1898. Khanu Khatan, female, 20 years, inoculated on 6th May 1898. Piru Khaki, male, 30 years, inoculated on 6th May 1898. Khatan Khaki, male, 30 years, inoculated on 9th May 1898. Hira Bsa, female, 25 years, inoculated on 6th May 1898. Muhammad Ismail, male, 13 years, inoculated on 5th May 1898. Husan Piru, male, 9 years, inoculated on 4th May 1898. Rani Husein, female, 25 years, inoculated on 4th May 1898. Najuk Husein, male, 8 years, inoculated on 4th May 1898. Rahimtula Piru, male, 5 years, inoculated on 12th May 1898. Zenub Piru, female, 13 years, inoculated on 9th May 1898. Piru Khalikuna, male, 45 years, inoculated on 9th May 1898.	*Shakur Haji, female, 8 years. Sakina Muhammad, female, 70 years. Piru Husein, female, 25 years. Husein Alahvario, male, 28 years. * Shakur was attacked on 12th May 1898; bubo in right groin, died in Khoja Hospital on the 15th idem. Caste—Mussulman Khoja. Occupation—Nil. Birthplace—Karachi. General health—No record.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	42.	
Plot No. 117 C-2, Rhymtula Street, Machi Miani Quarter.	Bana Esa, male, 27 years, inoculated on 9th May 1898. Sonbai Karim, female, 22 years, inoculated on 10th May 1898. Bhanbai Esa, female, 8 years, inoculated on 18th May 1898. Elaya Bana, male, 8 years, inoculated on 6th May 1898. Virbai Bani, female, 25 years, inoculated on 9th May 1898. Sakina Alahrakhia, female, 24 years, inoculated on 6th May 1898. Rehmu Elaya, male, 18 years, inoculated on 9th May 1898. Nathi Alahrakhai, female, 7 years, inoculated on 4th May 1898. Jana Alahrakhia, female, 16 years, inoculated on 6th May 1898. Alahrakhia Nensi, male, 40 years, inoculated on 6th May 1898. Gulu Alahrakhia, male, 3 years, inoculated on 4th May 1898.	*Purbai Mowji, female, 70 years. * Purbai was attacked on 13th May 1898; discharged cured from Khoja Hospital on 7th June 1898. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Katch. Present address—Plot No. 94 C-2, Rhymtula Street, Machi Miani Quarter. General health—No record.
	43.	
Plot No. 94 C-2, Rhymtula Street, Machi Miani Quarter.	Hashim Khimun, male, 20 years, inoculated on 5th May 1898. Ratu Alahrakhai, male, 25 years, inoculated on 5th May 1898.	*Khimun Haji, male, 45 years. Sajunbai Khimun, female, 40 years. * Khimun was attacked on 15th May 1898 and discharged cured from Khoja Hospital on 14th June 1898. Caste—Musalman, Khoja. Occupation—Coolie. Birthplace—Katch. Present address—Plot No. 94 C-2, Rhymtula Street, Machi Miani Quarter. General health—No record.
	44.	
Plot No. 32 A-12, Pahria Street, Machi Miani Quarter.	Gulu Hirji, male, 12 years, inoculated on 7th May 1898. Fatma Hirji, female, 4 years, inoculated on 6th May 1898. Nurbai Hirji, female, 45 years, inoculated on 6th May 1898. Vasan Kishna, female, 32 years, inoculated on 6th May 1898.	*Kisna Esar, male, 40 years. * Kisna was attacked on 17th May 1898 and died in Khoja Hospital on the following day. Caste—Musalman, Khoja. Occupation—Grocer. Birthplace—Karachi. General health—No record.
	45.	
Plot No. 74 A-12, Chandumal Street, Machi Miani Quarter.	Basria Ladha, male, 30 years, inoculated on 9th May 1898. Mariam Basria, female, 25 years, inoculated on 5th May 1898. Jana Meher Ali, female, 30 years, inoculated on 9th May 1898. Bhanbai Basria, female, 30 years, inoculated on 5th May 1898. Kanji Basria, male, 8 years, inoculated on 5th May 1898. Ali Musa, male, 7 years, inoculated on 5th May 1898. Nathi Musa, female, 8 years, inoculated on 5th May 1898. Meher Ali Ladha, male, 25 years, inoculated on 9th May 1898.	*Nenbai Ladha, female, 50 years. * Nenbai was attacked on 18th May 1898 and died in her house on the same date.. Caste—Musalman, Khoja. Occupation—Nil. Birthplace—Karachi. General health—No record.
	46.	
Karimji's garden, Garden Quarter.	Bhanji Chaja, male, 65 years, inoculated on 18th May 1898. Keso Bhanji, male, 13 years, inoculated on 10th May 1898. Karim Ali Bhanji, male, 17 years, inoculated on 13th May 1898.	*Kasu Abdula, male, 17 years. * Kasu was attacked on 18th May 1898 and died in his house on the 19th idem. Caste—Musalman, Khoja. Occupation—Grass-seller. Birthplace—Karachi. General health—No record.

Full Address.	Names, Sexes and Ages of the *inoculated* Persons who were living in the House on the Date of Attack, with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of onset of Disease, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	47.	
Plot No. 1 I-9, Lawrence Road, Garden Quarter.	Valji Sachu, male, 25 years, inoculated on 17th May 1898.	*Ladak Sachu, male, 28 years. Sachu Alu, male, 60 years. Thawar Sachu, male, 35 years. Bachi Thawar, female, 30 years. Fatu Thawar, female, 4 years. Janbai Thawar, female. 2 years. Esa Thawar, male, 16 years. Hirbai, Ladak, female, 20 years. Ali Ladak, male, 4 years. Shiran Ladak, female, 6 months. Suleman Sachu, male, 8 years. Ramzan Thawar, male, 2½ years. Kurmi Sachu, male, 14 years. * Ladak was attacked on 19th June 1898 and died in his house on the 20th idem. Caste—Mussalman, Khoja. Occupation—Grass-seller. Birthplace—Karachi. General health—No record.
	48.	
Plot No. 195 E-7, Amba Villa Street, Ranchor Quarter.	Santuk Govind, male, 20 years, inoculated on 19th May 1898. Jetha Megha, male, 7 years, inoculated on 19th May 1898. Maku Narayan, male, 35 years, inoculated on 19th May 1898. Purbai, Valji, female, 20 years, inoculated on 17th May 1898. Shevbai Moti, female, 25 years, inoculated on 17th May 1898. Mohan Bechar, male, 9 years, inoculated on 21st May 1898. Jeram Nursi, male, 9 years, inoculated on 21st May 1898. Valji Nathu, male, 20 years, inoculated on 21st May 1898. Mitha Jiwraj, male, 30 years, inoculated on 21st May 1898. Gangaram Tulsi, male, 17 years, inoculated on 21st May 1898. Megha Jiva, male, 12 years, inoculated on 21st May 1898. Moti Nathu, male, 25 years, inoculated on 21st May 1898. Gela Gohur, male, 20 years, inoculated on 21st May 1898.	*Mulji Vagha, male, 25 years. * Mulji was attacked on 21st May 1898; bubo in right groin; died in Civil Hospital on 24th May 1898. Caste—Hindu, Sutar (carpenter). Occupation—Carpenter Birthplace—Katch. General health—No record.
	49.	
Plot No. 19 E-21, Frere Road, Serai Quarter.	Javarsing Nihalsing, male, 38 years, inoculated on 7th May 1898. Narayandas Thakurdas, male, 26 years, inoculated on 7th May 1898. Girdharlal Parmanand, male, 25 years, inoculated on 7th May 1898. Dayaram Satramdas, male, 39 years, inoculated on 7th May 1898. Hemraj Fatehchand, male, 27 years, inoculated on 17th May 1898. Pohumal Narayansing, male, 32 years, inoculated on 17th May 1898. Tikamdas Dhanrajmal, male, 21 years, inoculated on 17th May 1898.	One male servant; particulars not known. *Dharamdas Sobhraj, male, 42 years. * Dharamdas was attacked on 23rd May 1898; bubo in right groin; discharged cured from Vishindas Hospital on 17th June 1898. Caste—Hindu, Amil. Occupation—Clerk. Birthplace—Sehwan. Present address—Not known. General health—No record.
	50.	
Plot No. 5 B-10, Bellasis Street, Serai Quarter.	Zilu Sambu, male, 20 years, inoculated on 7th May 1898. Gangaram Raghu, male, 30 years, inoculated on 21st May 1898. Madhu Raghu, male, 25 years, inoculated on 23rd May 1898.	*Zilu Dadu, male, 20 years. * Zilu Dadu was attacked on 29th May 1898; buboes in right and left groins; discharged cured from Civil Hospital on 27th June 1898. Caste—Hindu, Mahratta. Occupation—Peon. Birthplace—Malvan. Present address—Plot No. 5 B-10. Bellasis Street, Serai Quarter. General Health—No record.

Full Address.	Names, Sexes, and Ages of the *inoculated* Persons who were living in the House on the Date of Attack with the Dates of their Inoculation. Name, Sex, Age of the Attacked, if he is amongst the *inoculated*; Date of Onset of Diseases, Symptoms, Issue.	Names, Sexes, and Ages of the *un-inoculated* Persons who were living in the same House on the Date of Attack. Name, Sex, Age of the Attacked, if he is amongst the *un-inoculated*; Date of Onset of Disease, Symptoms, Issue.
	51.	
Plot No. 13 B-7, Panjrapur, Road, Rambagh Quarter.	Lakha Punja, male, 50 years, inoculated on 28th May 1898. Jetha Lakha, male, 7 years, inoculated on 28th May 1898.	Jamna, female, 1½ years. *Mithabai Lakha, female, 30 years. * Mithabai was attacked on 31st May 1898 and died in her house on 1st June 1898. Caste—Hindu, Katchi, Lohana. Occupation—Nil. Birthplace—Katch. General health—No record.
	52.	
Plot No. 6 A-12, Imamwara Street, Machi Miani Quarter.	Dharamsi Lila, male, 60 years, inoculated on 29th May 1898.	*Ghulam Husein Dharamsi, male, 20 years, * Ghulam Husein took ill on 31st May 1898; bubo in right groin; died in his house on 1st June 1898. Caste—Musalman, Khoja. Occupation—Shopkeeper. Birthplace—Karachi. General health—No record.
	53.	
Plot No. 86 B-6, Yusif Street, Rambagh Quarter	Wahidna Yusuf, male, 42 years, inoculated on 25th April 1898. Ahmed Wahidna, male, 19 years, inoculated on 25th April 1898. Abdul Rahim, male, 12 years, inoculated on 25th April 1898. Janbai Sitaram, female, 13 years, inoculated on 17th May 1898.	*Zuli Khan Yusaf, female, 80 years. * Zuli Khan took ill on 2nd June 1898 bubo in right axilla; died in Memon Hospital on the 5th idem. Caste—Mussalman, Memon. Occupation—Nil. Birthplace—Bhuj. General health—No record.
	54.	
Plot No. 51 E-4, Dharams Street, Ranchor Quarter.	Umarsi Kuverji, male, 70 years, inoculated on 2nd June 1898. Valji Umarsi, male, 30 years, inoculated on 2nd June 1898. Ratan Vela, female, 20 years, inoculated on 2nd June 1898.	*Punjibai Umarsi, female, 60 years. * Punjibai was attacked on 2nd June 1898; bubo in right axilla; discharged from Dufferin Hospital on 15th June 1898. Caste—Hindu, Katchi, Lohar. Occupation—Nil. Birthplace—Bhuj. Present address—Plot No. 51 E-4, Dharamsi Street, Ranchor Quarter. General health—No record.
	55.	
Plot No. 197 G-1, Clerk Street, Sadar Bazaar Quarter.	Nathu Ramchand, male, 42 years, inoculated on 23rd May 1898. Ganga Nathu, female, 40 years, inoculated on 10th May 1898. Mohan Ramchand, male, 38 years, inoculated on 10th May 1898. Nandlal Mohan, male, 10 years, inoculated on 9th May 1898.	*Nandbai Mohan, female, 28 years. * Nandbai was attacked on 14th June 1898, and died in her house on the 18th idem. Caste—Hindu, Soni. Occupation—Nil. Birthplace—Vadhwan. General health—No record.
	56.	
Plot No. 190 G-1, Stalker Street, Sadar Bazaar Quarter.	Meghji Gaba, male, 40 years, inoculated on 30th May 1898. Hirji Raghuji, male, 26 years, inoculated on 30th May 1898. Mewa Jetha, male, 20 years, inoculated on 30th May 1898. Govind Lakhu, male, 22 years, inoculated on 30th May 1898. Ladhibai Hirji, female, 8 years, inoculated on 30th May 1898. Jetha Gaba, male, 40 years, inoculated on 3rd July 1898. Karsan Raghuji, male, 12 years, inoculated on 3rd July 1898. Kesarbai Meghji, female, 25 years, inoculated on 3rd July 1898. Kuvarbai Jetha, female, 30 years, inoculated on 3rd July 1898. Dosu Vishram, female, 16 years, inoculated on 14th May 1898.	Parbati Vishram, female, 20 years. Wife of Mewa, 15 years. Wife of Govind, 18 years. Widow of Sheva, 40 years. *Puribai Raghu, female, 30 years. * Puribai was attacked on 7th July 1898; bubo in right groin; died in Vishindas Hospital on the 8th idem. Caste—Hindu, Mochi. Occupation—Nil. Birthplace—Katch. General health—No record.

APPENDIX A.

STATEMENT giving the NAMES of all INOCULATED PERSONS who developed PLAGUE, with other Particulars.

Serial No.	Plot Number.	Street.	Quarter.	Name of Patient.	Sex.	Age.	Date of Inoculation.	Date of Illness.	Date of Death.	Date of Discharge.	Remarks.
1	4 I-4	Aga's Garden	Garden	Muhammad Rhymtula.	Male	18	5.5.98	5.5.98	7.5.98	—	
2	—	Bagdadi	Lyari	Mauladad Shah Dost.	„	30	5.5.98	5.5.98	10.5.98	—	
3	74 A-12	Chandumal	Machi Miani	Thawar Meghji	„	19	5.5.98	10.5.98	—	1.6.98	
4	„	„	„	Mulbai Thawar	Female	13	5.5.98	10.5.98	—	1.6.98	
5	42 A-12	Imamwari	„	Ranbai Jafar	„	50	5.5.98	10.5.98	15.5.98	—	
6	94 C-2	Rhymtula	„	Ratanbai Piru	„	12	6.5.98	13.5.98	31.5.98	—	
7	28 A-12	Pahria	„	Begam Mitha	„	50	5.5.98	14.5.98	17.5.98	—	
8	86 C-2	Musa	„	Musa Mowji	Male	30	5.5.98	15.5.98	19.5.98	—	
9	74 A-12	Chandumal	„	Rakhia Musa	Female	7	5.5.98	17.5.98	—	9.6.98	
10	22 A-11	Muhammad Ali	„	Muhammad Meghji.	Male	6	5.5.98	17.5.98	20.5.98	—	
11	57 A-12	Imamwari	„	Kasim Wali	„	12	3.5.98	17.5.98	—	6.9.98	
12	74 A-12	Chandumal	„	Shewa Jiwraj	„	50	6.5.98	17.5.98	19.5.98	—	
13	—	Nasarpuri Camp.	Lyari	Jeja Mula	„	12	14.5.98	17.5.98	25.5.98	—	
14	117 C-1	Rhymtula	Machi Miani	Ratanbai Haji	Female	22	9.5.98	18.5.98	—	1.6.98	
15	—	Queen's Road	Queen's Road	Vela Teja	Male	17	3.5.98	20.5.98	—	2.6.98	
16	25 A-12	Gulam Husein	Machi Miani	Ranbai Yakub	Female	45	17.5.98	20.5.98	25.5.98	—	
17	21 G B-21	Hasan Ali	Serai	Raghu Panda	Male	35	20.5.98	22.5.98	26.5.98	—	
18	93 G-1	Somerset	Sadar	Kakumal Mulchand.	„	12	19.5.98	19.5.98	28.5.98	—	
19	„	„	„	Tolaram Bhojraj	„	10	19.5.98	31.5.98	—	22.6.98	Took ill in Lawrence Road Segregation Camp.
20	22 C-6	Bandar	Market	Devji Narayan	„	12	11.5.98	27.5.98	30.5.98	—	
21	22 A-12	Nasar	Machi Miani	Virbai Pesau	Female	35	6.5.98	28.5.98	—	20.6.98	
22	—	Miran Pir	Lyari	Daulat Gulu	„	3	5.5.98	1.6.98	3.6.98	—	
23	40 A-12	Imamwara	Machi Miani	Thakran Kulfan	„	60	9.5.98	2.6.98	4.6.98	—	
24	—	Miran Pir	Lyari	Alina Khatao	Male	15	9.5.98	3.6.98	—	20.6.98	
25	—	„	„	Karamsi Muhammad.	Female	22	6.5.98	3.6.98	—	20.6.98	
26	265 P. T.	Port Trust Lines.	Keamari	Jadu Bana	Male	19	28.5.98	3.6.98	—	5.7.98	
27	519 E-4	Gopal	Ranchor	Manki Daya	Female	10	19.5.98	6.6.98	10.6.98	—	
28	6 B-14	Narayan	Serai	Dhondi Bhawan	Male	40	23.5.98	11.6.98	18.6.98	—	
29	„	„	„	Govind Dhondi	„	12	23.5.98	13.6.98	—	17.7.98	
30	—	Amri	Lyari	Rewachand Ratanchand.	„	25	7.5.98	13.6.98	—	27.6.98	
31	23 G-1	Grain Market	Sadar	Bherumal Waliram.	„	22	27.5.98	15.6.98	—	14.7.98	
32	198 G-1	Clerk	„	Mulji Dhalu	„	70	4.6.98	17.6.98	—	11.7.98	
33	—	Sweepers' Camp.	Lyari	Piradita Bhola	„	22	6.5.98	20.6.98	—	10.8.98	
34	38 E-4	Teja	Ranchor	Vishram Arjun	„	30	25.5.98	20.6.98	—	10.7.98	
35	—	Sweepers' Camp.	Lyari	Bilanda Jamita	„	22	18.5.98	1.7.98	—	10.8.98	
36	515 E-4	Gopal	Ranchor	Purbhu Punji	„	23	21.5.98	16.7.98	17.7.98	—	
37	„	„	„	Manbai Bechar	Female	50	12.5.98	13.7.98	23.7.98	—	Took ill in Ranchor Health Camp.
38	„	„	„	Dewlibai Sundar	„	20	12.5.98	19.7.98	20.7.98	—	
39	„	„	„	Laxmon Hari	Male	25	21.5.98	21.7.98	—	3.8.98	
40	„	„	„	Sundar Hari	„	20	21.5.98	26.7.98	2.8.98	—	Took ill in Lawrence Road Segregation Camp.
41	No. 115	„	„	Nanchand Bhagwan.	„	28	17.5.98	29.7.98	30.7.98	—	
42	„	„	„	Sundar Bhagwan	„	22	21.5.98	4.8.98	5.8.98	—	Took ill in Lawrence Road Segregation Camp.
43	228 E-1	Bambridge	Jail	Ismail Ahmed	„	25	14.5.98	3.8.98	3.8.98	—	
44	163 E-7	Amba Villa	Ranchor	Sunku Valji	Female	8	25.5.98	10.8.98	11.8.98	—	
45	—	Magar Pir	Garden	Mima Ebrahim	„	10	18.5.98	14.10.98	—	17.11.98	
46	—	„	„	Moti Premji	Male	19	12.5.98	16.10.98	—	17.11.98	
47	—	„	„	Jiwraj Gowa	„	35	12.5.98	16.10.98	—	17.11.98	

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APPENDIX B.

STATEMENT giving NAMES of INOCULATED PANJABHAI KHOJAS who developed PLAGUE, with other Particulars.

Serial No.	Plot Number.	Street.	Quarter.	Name of Patient.	Sex.	Age.	Date of Inoculation.	Date of Illness.	Date of Death.	Date of Discharge.
1	4 I-4	Aga's Garden	Garden	Muhammad Rhymtula	Male	18	5.5.98	5.5.98	7.5.98	—
2	74 A-12	Chandumal	Machi Miani	Thawar Megji	„	19	5.5.98	10.5.98	—	1.6.98
3	„	„	„	Mulbai Thawar	Female	13	5.5.98	10.5.98	—	1.6.98
4	42 A-12	Imamwara	„	Ranbai Jafar	„	50	5.5.98	10.5.98	15.5.98	—
5	94 C-2	Rhymtula	„	Ratanbai Piru	„	12	6.5.98	13.5.98	31.5.98	—
6	28 A-12	Parhia	„	Begam Mitha	„	50	5.5.98	14.5.98	17.5.98	—
7	86 C-2	Musa	„	Musa Mowji	Male	30	5.5.98	15.5.98	19.5.98	—
8	74 A-12	Chandumal	„	Rakhia Musa	Female	7	5.5.98	17.5.98	—	9.6.98
9	22 A-11	Muhammad Ali Mukhi.	„	Muhammad Megji	Male	6	5.5.98	17.5.98	20.5.98	—
10	57 A-12	Imamwara	„	Kasim Wali	„	12	3.5.98	17.5.98	—	19.5.98
11	74 A-12	Chandumal	„	Shewa Jiwraj	„	50	6.5.98	17.5.98	19.5.98	—
12	117 C-1	Rhymtula	„	Ratanbai Haji	Female	22	9.5.98	18.5.98	—	1.6.98
13	53 A-12	Musa	„	Virbai Pesun	„	35	6.5.98	28.5.98	—	20.6.98
14	„	Miran Pir	Lyari	Daulat Gulu	„	3	5.5.98	2.6.98	3.6.98	—
15	40 A-12	Imamwara	Machi Miani	Thakrani Kulfan	„	60	9.5.98	2.6.98	5.6.98	—
16	—	Mitan Pir	Lyari	Alidina Khatao	Male	15	9.5.98	3.6.98	—	20.6.98
17	—	„	„	Karamsi Muhammad	Female	22	6.5.98	3.6.98	—	20.6.98
18	—	Magar Pir Road	Garden	Mima, daughter of Ebrahim.	„	10	18.5.98	14.10.98	—	17.11.98
19	—	„	„	Moti Premji	Male	15	12.5.98	16.10.98	—	17.11.98
20	—	„	„	Jewraj Gowa	„	35	12.5.98	16.10.98	—	17.11.98

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APPENDIX C.

STATEMENT giving the NAMES of UNINOCULATED PANJABHAI KHOJAS who developed PLAGUE, with other PARTICULARS.

Serial No.	Plot No.	Street.	Quarter.	Name of Patient.	Sex.	Age.	Date of Illness.	Date of Death.	Date of Discharge.	Remarks.
1	13 A-1	Khoja	Old Town	Muhammad Abdula	Male	4	23.4.98	—	14.6.98	
2	55 A-26	Chubba	Napier	Lilo Meghji	Female	70	24.4.98	26.4.98	—	
3	„	„	„	Nurbai Ismail	„	4	24.4.98	26.4.98	—	
4	16 A-12	Rampart	Machi Miani	Piru Alidina	Male	50	27.4.98	2.5.98	—	
5	20 K-5	Miran Pir	Lyari	Bulu Hashu	„	32	27.4.98	—	9.6.98	
6	55 A-26	Chubba	Napier	Manghibai Manji	Female	2	28.4.98	30.4.98	—	
7	30 A-27	Napier	„	Nanbai Ismail	„	22	29.4.98	—	26.5.98	
8	„	„	„	Sajan Dharamsi	Male	14	29.4.98	3.5.98	—	
9	13 A-1	Khoja	Old Town	Mama Abdula	Female	40	30.4.98	—	14.6.98	
10	86 C-2	Musa	Machi Miani	Kesabai Mowji	„	25	1.5.98	—	9.6.98	
11	—	Voluntary camp	Trans-Lyari	Asan Jadhowji	Male	12	1.5.98	—	9.6.98	
12	12 C-1	Old Machi Miani.	Machi Miani	Havabai Hasan	Female	8	2.5.98	3.5.98	—	Resident of Napier Quarter.
13	95 C-2	Parhia	„	Lalbai Piru	„	60	2.5.98	4.5.98	—	
14	22 A-11	Muhammad Ali Mukhi.	„	Rata Nathu	„	20	2.5.98	4.5.98	—	
15	„	Kasim	„	Sakina Bachu	„	15	3.5.98	6.5.98	—	
16	—	Miran Pir	Lyari	Suleman Nandhu	„	45	3.5.98	4.5.98	—	
17	—	„	„	Ramzan Alidina	Male	40	3.5.98	3.5.98	—	
18	—	Voluntary camp	Trans-Lyari	Hashim Ali Jadhowji.	„	10	3.5.98	3.5.98	—	

Serial No.	Plot No.	Street.	Quarter.	Name of Patient.	Sex.	Age.	Date of Illness.	Date of Death.	Date of Discharge.	Remarks.
19	95 C-2	Parhia	Machi Miani	Alibhai Murji	Male	17	3.5.98	5.5.98	—	Resident of Napier Quarter.
20	—	„	„	Kasu Walla	„	6	3.5.98	—	26.5.98	
21	18 A-12	Rampart	„	Mehr Ali Hirji	„	40	3.5.98	4.5.98	—	
22	86 C-2	Musa	„	Hirbai Balu	„	20	3.5.98	—	26.5.98	
23	88 C-2	Rhymtula	„	Jafar Nensi	Female	30	3.5.98	10.5.98	—	
24	30 A-1	Budharmal	Old Town	Manbai Hashim	Male	40	5.5.98	6.5.98	—	
25	56 A-12	Imamwara	Machi Miani	Shukar Haji	Female	8	11.5.98	15.5.98	—	
26	—	Voluntary camp	Trans-Lyari	Lalji Jamal	„	22	11.5.98	13.5.98	—	
27	23 A-11	Muhammad Ali Mukhi.	Machi Miani	Sakina Dama	Male	15	12.5.98	13.5.98	—	
28	117 C-1	Rhymtula	„	Purbai Haji	Female	70	13.5.98	—	26 5.98	
29	85 A-9	Rampart	Old Town	Verji Rahim	„	45	14.5.98	18.5.98	—	
30	94 C-2	Rhymtula	Machi Miani	Kheman Haji	Male	45	15.5.98	—	14.6.98	
31	32 A-12	Parhia	„	Kishna Essar	„	40	17.5.98	19.5.98	—	
32	74 A-12	Chandumal	„	Nenbai Ladha	„	50	18.5.98	18.5.98	—	
33	—	Karim Ali's garden.	Garden	Hasim Abdula	Female	17	18.5.98	19.5.98	—	
34	1 I-9	Lawrence Road	„	Ladik Sachu	Male	28	19.5.98	20.5.98	—	
35	1 I-9	„ „	„	Chagbai Sachu	„	60	26.5.98	4.6.98	—	
36	6 A-12	Imamwara	Machi Miani	Ghulam Husein Dharamsi.	Male	20	31.5.98	1.6.98	—	
37	—	Miran Pir	Lyari	Datu Chokra	„	42	1.6.98	1.6.98	—	

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APPENDIX D.

STATEMENT giving the NAMES of the UNINOCULATED PIRAI KHOJAS who developed PLAGUE, with other PARTICULARS.

Serial No.	Plot No.	Street.	Quarter.	Name of Patient.	Sex.	Age.	Date of Illness.	Date of Death.	Date of Discharge.
1	8 A-1	Khoja	Old Town	Kurbai Piru	Female	40	23.4.98	—	26.5.98
2	38 A-1	Budharmal	„	Safar Waru	Male	12	28.4.98	30.4.98	—
3	46 A-1	„	„	Bai Pirana	Female	35	30.4.98	4.5.98	—
4	41 A-10	Rampart	Bandar	Musa Rahimana	Male	24	30.4.98	1.5.98	—
5	„	„	„	Fatma Rahimana	Female	12	30.4.98	1.5.98	—
6	„	„	„	Rahimana Hashim	Male	50	2.5.98	3.5.98	—
7	„	„	„	Sakina Rahimana	Female	40	5.5.98	6.5.98	—
8	31 A-1	Budharmal	Old Town	Vasandbai Teja	„	17	9.5.98	11.5.98	—
9	64 A-12	Imamwara	Machi Miani	Padha Haji Chotu	„	20	10.5.98	11.5.98	—
10	8 A-1	Khoja	Old Town	Hasan Moheb	Male	25	11.5.98	12.5.98	—
11	50 A-1	Budharmal	„	Rani Fazal	Female	45	14.5.98	15.5.98	—
12	5 A-11	Muhammad Yusif.	Machi Miani	Kamber Teja	Male	22	15.5.98	16.5.98	—
13	2 B-16	Kacheri	Serai	Alahna Nebhau	„	30	16.5.98	26.5.98	—
14	—	Navalmal Narumal's garden.	Garden	Hasan Chibhar	„	55	18.5.98	19 5.98	—

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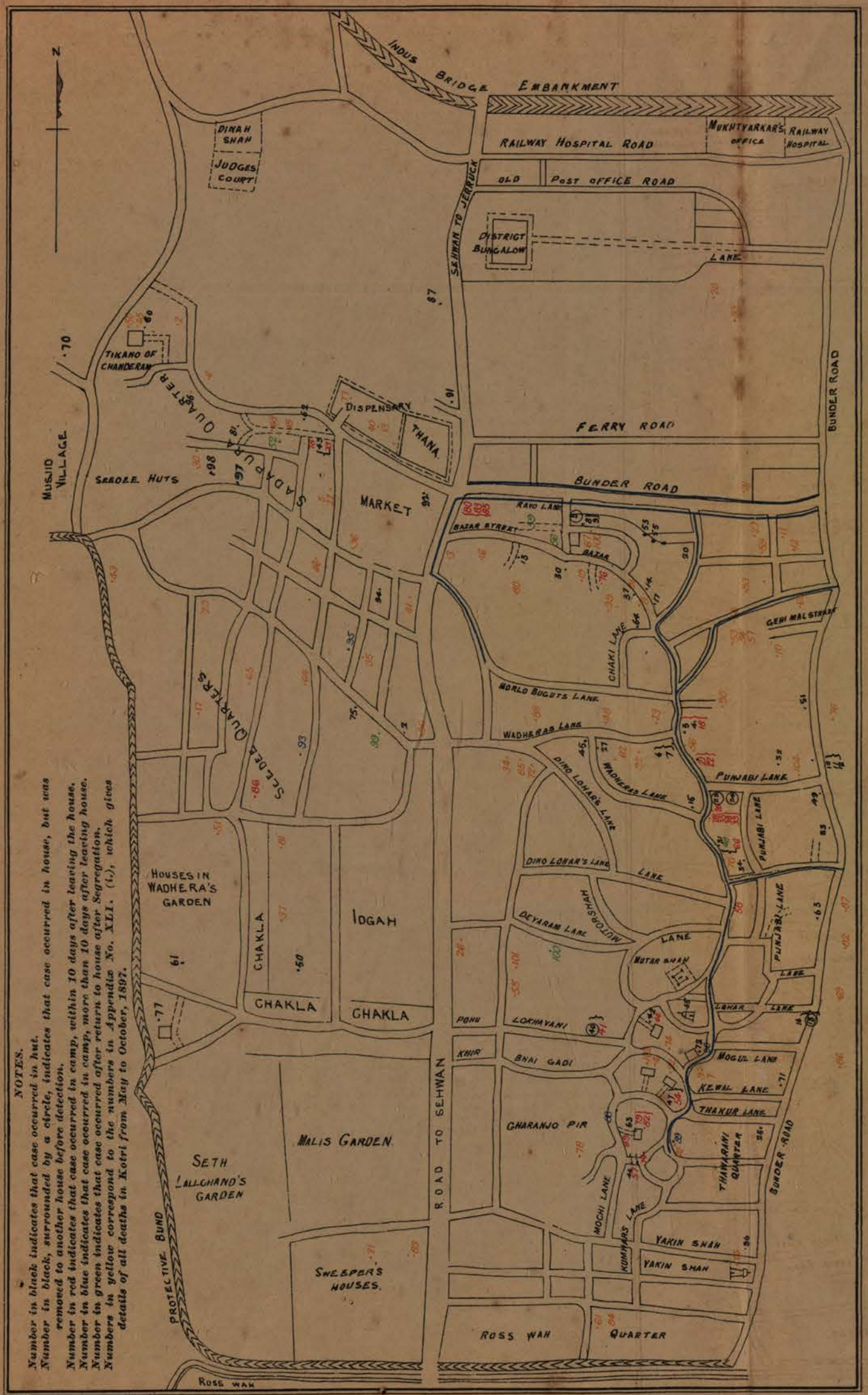
Appendix No. XLI
(See Questions Nos. 12,544 & 12,583)

PLAN OF THE TOWN OF KOTRI IN SIND SHOWING THE COURSE OF THE EPIDEMIC OF PLAGUE.



NOTES.

Number in black indicates that case occurred in hut.
Number in black, surrounded by a circle, indicates that case occurred in house, but was removed to another house before detection.
Number in red indicates that case occurred in camp, within 10 days after leaving the house.
Number in blue indicates that case occurred in camp, more than 10 days after leaving house.
Number in green indicates that case occurred after return to house after Segregation.
Numbers in yellow correspond to the numbers in Appendix No. XLI. (i.), which gives details of all deaths in Kotri from May to October, 1897.

APPENDIX No. XLI. (i.).

(See Question No. 12,583.)

STATEMENT showing the NAMES of PERSONS who died between 1st May 1897 and 31st October 1897, in KOTRI, SIND.

No.	Name of the Deceased.	Age.	Sex.	Caste.	Street in Question.	Remarks.
				MAY 1897.		
1	Bhagul wife of Rajib -	30 years	Female	Bhati Muhammadan -	Died in Camp Landhis.	
2	Awali - - -	65 „	„	Goani (native of Goa)	Sadapura	
3	Usman Khair Mahomed	22 „	Male	Khati Muhammadan -	Near Old Dharamsala.	
4	Narain Wald Dhalu -	16 „	„	Nassarpuri Lohana -	Mukhi Street.	
5	Tahil Wald Karma - -	9 „	„	Hindu Lohana -	Market.	
6	Nepal - - -	35 „	„	Goani (native of Goa)	Sadapura.	
7	Khemo Wald Naun -	38 „	„	Hindu Lohana -	Khotani Street.	
8	Dewan Wald Nenu -	22 „	„	Hindu Vanho - -	Bazar, near Tolaram's shop.	
9	Mulo Wald Naun - -	18 „	„	Hindu Vanho - -	Khotani Street.	
10	Kalu Wald Thaku - -	9 months	„	Hindu Khudabadi -	Gehimal Shrof's Street.	
11	Soomji Wald Mengho -	—	„	Hindu Kachhi - -	Alimchand's Street.	
12	Son of Kashino - -	2 months	„	Hindu Kachhi - -	Alimchand's Street.	
13	Abdullah Wald Allahbux	33 years	„	Panjabi Muhammadan	Died in hospital.	
14	Khanu Wald Nehhaoo -	4 „	„	Hindu Lohana -	Urs Punjabis Street.	
15	Haru Wald Mohan -	5 „	„	Hindu Gacherai - -	Near Thakur's Than.	
				JUNE 1897.		
16	Kirishi wife of Haji Hassan	90 „	Female	Pathan Muhammadan	Kakumal's Street.	
17	Son of Karu - -	One day	Male	Memon Muhammadan	Seedee lines.	
18	Saleh Wald (not known)	70 years	Market	Memon Muhammadan	Bhagal's Street.	
19	Wife of Naroo - -	14 „	Female	Hindu Marwari - -	Bazar.	
20	Son of Kodo -	5 days	Male	Nassarpuri Lohana -	Thawerani Street.	
21	Bhagul wife of Jaro -	52 years	Female	Malhi Muhammadan -	Near Ross Wah.	
22	Bharu Wald Kewal -	62 „	Male	Hindu Lohana -	Market.	
23	Yusif Wald Arah - -	10 days	„	Memon Muhammadan	Seedee lines.	
24	One male fakir - -	30 years	„	Hindu Pardesi	Near burning ground	These two were Pardesi fakirs, husband and wife, and died in consequence of the falling of a banyan tree upon them on account of very strong wind.
25	One female fakir - -	35 „	Female	Hindu Pardesi - -	Near burning ground -	
26	Janu daughter of Tagio -	10 months	„	Ahra Muhammadan -	Id Gah.	
27	Tikam Wald Kesowdas -	19 „	Male	Hindu Lala - -	Alimchand Street.	
				JULY 1897.		
28	Usman Wald Charki -	5 „	„	Makrani Muhammadan	Bunder Station.	
29	Ambar Wald (not known)	55 years	„	Sheikh Muhammadan -	Near Juma Mosque.	
30	Sabhai wife of —— -	60 „	Female	Shidi Muhammadan -	Seedee lines.	
31	Jahanshah Wald (not known)	30 „	Male	Sayad Muhammadan -	Near Bhang Shop.	
32	Narain Wald Ladho -	10 days.	„	Nassarpuri Lohana -	Mukhi Street.	
33	Asha daughter of Khamiso	7 years	Female	Makrani Muhammadan	Bunder Station.	
34	Chuto Wald Rangoo -	83 „	Male	Hindu Khudabadi -	Malik's Parao.	
35	Son of Mengho - -	1 hour	„	Hindu Lohana -	Seedee lines.	
36	Bachal daughter of Abdullah.	7 years	Female	Mugal Muhammadan -	Market.	
37	Jiari daughter of Jumo -	9 months	„	Shidi Muhammadan -	Seedee lines.	
				AUGUST 1897.		
38	Haji Wald Khair Mahomed	10 years	Male	Chandio Muhammadan	Mahomed Shahjo Tando.	
39	Bakhtawar wife of Ghulam	30 „	Female	Pathan Muhammadan -	Ross Wah.	
40	Abdul Gani Wald Shamshuldin.	25 „	Male	Sayad Muhammadan -	Died in hospital	Not local resident.
41	Lali daughter of Ramzan	6 months	Female	Sheik Muhammadan -	Market.	
42	Dhaniani daughter of Juno	8 years	„	Muhammadan Mirhabir	Ross Wah.	
43	Kazu daughter of Pirbux	3 „	„	Muhammadan Shidi -	Seedee lines.	
44	Mahi daughter of Saleh -	20 months	„	Muhammadan Shidi -	Mahomed Shahjo Tando.	
45	Mano Ardas —— - -	60 years	Male	Hindu Pardesi -	Bhagat's Tikana.	
46	Jellio Wald Deto -	52 „	„	Hindu Lohana - -	Market.	
47	Son of Juman - -	4 days	„	Muhammadan Wadho -	Mahomed Shahjo Tando.	
48	Dhaun wife of Chuli -	14 years	Female	Muhammadan Khati -	Malik's Parao.	
49	Yunis Wald Abdullah -	9 months	Male	Muhammadan Kumbhar	Mahomed Shahjo Tando.	
50	Jeramdas Doyaram -	50 years	„	Hindu Bhagar - -	Bhagat's Tikana.	
51	Jumo Wald Bilowal -	35 „	„	Muhammadan Abra -	Wali Mahomed's Street.	

No.	Name of the Deceased.	Age.	Sex.	Caste.	Street in Question.	Remarks.
				SEPTEMBER 1897.		
52	Janib wife of Mahomed -	30 years	Female	Muhammadan Abro -	Mumria Kullas.	
53	Kewal Wald Jamaat -	24 „	Male	Hindu Khudabadi -	Gehimal Shrof's Street.	
54	Amolbai wife of Jamaat -	70 „	Female	Hindu Khudabadi -	Gehimal Shrof's Street.	
55	Daughter of Metharam -	Still born	„	Hindu Nassarpuri Lohana.	Bhawanidas Street.	
56	Thaku Wald Mithu -	6 years	Male	Hindu Khati - -	Khati Street.	
57	Ghanu Wald Dhalu -	30 „	„	Hindu Khudabadi Lohana.	Gehimal Shrof's Street.	
58	Duli daughter of Nano -	3 „	Female	Hindu Khudabadi Lohana.	Gehimal Shrof's Street.	
58	Jethibai wife of Mengho -	16 „	„	Hindu Lala - -	Lala Kesodas Street.	
60	Asudo Wald Jamaat -	28 „	Male	Hindu Khudabadi Lohana.	Gehimal Shrof's Lane.	
61	Jindo wife of Nazar Mahomed.	18 „	Female	Kureshi Muhammadan	Kazi Street.	
62	Rupo Wald Mulo -	14 „	Male	Kindu Khati - -	Khati Street.	
63	Makoro Wald Dado -	40 „	„	Maghrio Muhammadan	Nagha Shah lines.	
64	Lilo Wald Satram -	16 days	„	Hindu Lohana - -	Near Chaklo.	
65	Bachayo Wald Daim -	30 years	„	Saujrani Muhammadan	Idan Tiadal's Parao.	
				OCTOBER 1897.		
66	Bhagpari wife of Jaro -	45 „	Female	Musalman Machi -	Nagashah lines.	
67	Isarbai wife of Tolo -	21 „	„	Hindu Lohana -	Mahomed Patoli Lane.	
68	Cheti daughter of Thawar	1 month	„	Hindu Lohana - -	Bazar Lane.	
69	Son of Kumhar - -	Still born	Male	Muhammadan Mirhobir	In boat at River Bank.	
70	Punja wife of Jetho -	35 years	Female	Hindu Nassarpuri -	Mahomed Patoli lines.	
71	Achar son of Iso -	40 „	Male	Musalman Manjhand -	Nagashah lines.	
72	Pohu son of Nathu -	30 „	„	Hindu Nassarpuri -	Bhowanidas Street.	
73	Rocha daughter of Khoto	9 „	Female	Hindu Nassarpuri -	Mahomed Patoli Lane.	
74	Chandu Ramamal -	1 year 3 months.	„	Hindu Nassarpuri -	Bhowanidas Street.	
75	Daughter of Mahi Khan -	Still born	„	Musalman Abro -	Naghashah Lane.	
76	Jahan Shah Ahmed Shah	5 years	Male	Musalman Sayad -	Bunder Road.	
77	Lekhu son of Rochi -	40 „	„	Hindu Lohana -	Market.	
78	Darumal Asudomal -	33 „	„	Hindu Lohana - -	Shamdas Lane.	
79	Allah Bachayo Harun -	9 months	„	Musalman Mohana -	Naghashah lines.	
80	Chandan Manik - -	35 years	„	Hindu Khudabadi -	Bazar Lane.	
81	Akbar Abdul Khalik -	6 months	„	Muhammadan Pathan -	Near Ross Wah.	
82	Chutta Abdul Ruf -	5 „	„	Muhammadan Mohana	River Bank.	
83	Begum wife of Jaro -	28 years	Female	Muhammadan Machi -	River Bank.	
84	Khudabakhsh Nazar Mahomed.	7 months	Male	Muhammadan Mulo -	Bunder Road.	
85	Rochalbai wife of Kewal -	45 years	Female	Hindu Nassarpuri -	Bhowanidas Street.	
86	Bachi daughter of Aloo -	8 „	„	Muhammadan Mohana	River Bank.	
87	Haji Rahdino - -	26 „	Male	Muhammadan Mohana	River Bank.	
88	Ahmed Khan Izat Khan -	18 „	„	Muhammadan Numrio	Maliks' Lane.	
89	Mehrban - -	60 „	„	Muhammadan Punjabi	Not traceable.	
90	Lachmi wife of Khoto -	30 „	Female	Hindu Nassarpuri -	Mahomed Potoli Lane.	
91	Gagu Wald Akhio -	45 „	Male	Hindu Marwari - -	Bazar Lane.	
22	Daya daughter of Nathu	10 „	Female	Hindu Khati - -	Khati Lane.	
93	Topan son of Mengho -	28 „	Male	Hindu Lohana - -	Market.	
94	Suhni daughter of Mehar	9 months	Female	Muhammadan Gadi -	Near Rifle Range.	
95	Imdad Wald Chokar -	18 years	Male	Muhammadan Chandio	Seydee lines.	
96	Vensi Kundan - -	18 „	„	Hindu Lohana -	Rewamal's Lane.	
97	Rokhio —— - -	60 „	„	Muhammadan Machi -	Naghashah lines.	
98	Mamoo Wald Gul -	8 „	„	Muhammadan Chandio	Tando Mahomed Shah.	
99	Muli wife of Khanu -	30 „	Female	Hindu Lohana -	Bazar Lane.	
100	Cheeta daughter of Tolo -	1 month	„	Hindu Lohana - -	Mahomed Patoli.	
101	Tilee daughter of Khanchand.	7 months	„	Hindu Sahto - -	Mukhi Street.	
102	Tahilram Pahlajrai - -	40 years	Male	Hindu Brahman - -	Bhagat Lane.	
103	Jammuram Haninoram -	20 „	„	Hindu Punjabi -	Rewamal's Street	This was the first case of plague of the second epidemic.
104	Bachi wife of Kauro -	70 „	Female	Muhammadan Punjabi	River Bank.	

APPENDIX No. XLI. (ii.)
(*See* Question No. 12,583.)

APPENDIX No. XLI. (ii.).

(*See* Question No. 12,583.)

STATEMENT showing PARTICULARS of DEATHS from all CAUSES that occurred during the MONTHS of SEPTEMBER and OCTOBER 1897 at KOTRI, SIND.

No.	Name of Deceased.	Father or Husband's Name.	Age.	Caste.	Occupation of Males.	Period of Illness.	Cause of Death.	Date of Death.	Under Medical Treatment.	Examined after Death.	Name of Head of House in which Death occurred.	Period of Residence of Deceased at Kotri.	Remarks.
1	Janib, wife of	Mahomed	30 years	Muhammadan Gadi	Coolie	Unknown	Fever	3.9.97	No	No	Mahomed	Local resident.	Lived and died near mosques on Bolari Road outside limits of place.
2	Kewal	Jamaat Mal	24 „	Hindu Lohana	Tinker	„	Brain fever	3.9.97	Yes	„	Jamaat Mal	„	
3	Amolbai, wife of	„	70 „	„ „	„	„	Fever	5.9.97	„	„	„	„	Mother of No. 2 of this statement.
4	Daughter of	Metharam	—	„ „	—	—	Still-born	6.9.97	No	„	Metharan	„	Mother did well.
5	Thaku	Mithu	6 years	Hindu Khati	Dyer	Unknown	Fever	10.9.97	Yes	„	Mitho	„	On visiting terms with No. 11 of this statement.
6	Ghanu	Dhalumal	30 „	Hindu Khudabadi Lohana.	Cloth seller	„	Dysentery	12.9.97	No	„	Mulomal	„	Next door to Nos. 2 and 3 of this statement.
7	Duli, daughter of	Nano	3 „	„ „	Grocer	„	Asthma	15.9.97	„	„	Nano	„	Three houses from No. 6 of this statement not related.
8	Jethi bai, wife of	Mengho	16 „	Hindu Lohana	Peon	10 days	Fever	19.9.97	Yes	„	Mengho	„	
9	Asudomal	Jamaat Mal	28 „	„ „	Tinker	6 „	„	23.9.97	No	Yes, by R.S. Metharam.	Jamaat Mal	„	Brother of No. 2, and son of No. 3, of this statement.
10	Mai Jindo, wife of	Nazar Mahomed	18 „	Muhammadan Khalifa.	Teacher	5 months	„	23.9.97	Yes	„	Nazar Mahomed	„	
11	Rupo	Mulo	14 „	Hindu Khati	Dyer	12 days	„	23.9.97	No	No	Mulo	„	
12	Makoro	Dado	40 „	Muhammadan Machi.	Labourer	12 „	Obstruction of bowels.	26.9.97	„	Yes, by R.S. Metharam.	Lalu	„	Lived and died in Nangashah village.
13	Lilo	Satram	16 days	Hindu Lohana	Peon	16 „	Dysentery	26.9.97	Yes	„	Satram	„	
14	Bachayo	Daim	30 years	Muhammadan Shidi.	Fitter	2 years	Diabetes	29.9.97	No	„	Daim	„	
15	Bhagpari, wife of	Jaro	45 „	Muhammadan Machi.	Sweeper	2 months	Splenitis	2.10.97	„	„	Jaro	„	Lived and died in Nangashah village.
16	Isarbai, wife of	Tolo	21 „	Hindu Lohana	Tinner	6 days	Childbirth	2.10.27	Yes	„	Jetho	„	
17	Cheti, daughter of	Thawar	1 month	„ „	Grocer	6 „	Eczema	5.10.97	No	„	Moti	„	Mother did well.
18	Son of	Kamhar	—	Muhammadan Mohana.	Boatman	—	Still-born	6.10.97	„	„	Unknown	Unknown	In boat at river bank, which left a few days after arrival. The boat did not belong to Kotri, and no further particulars are ascertainable.

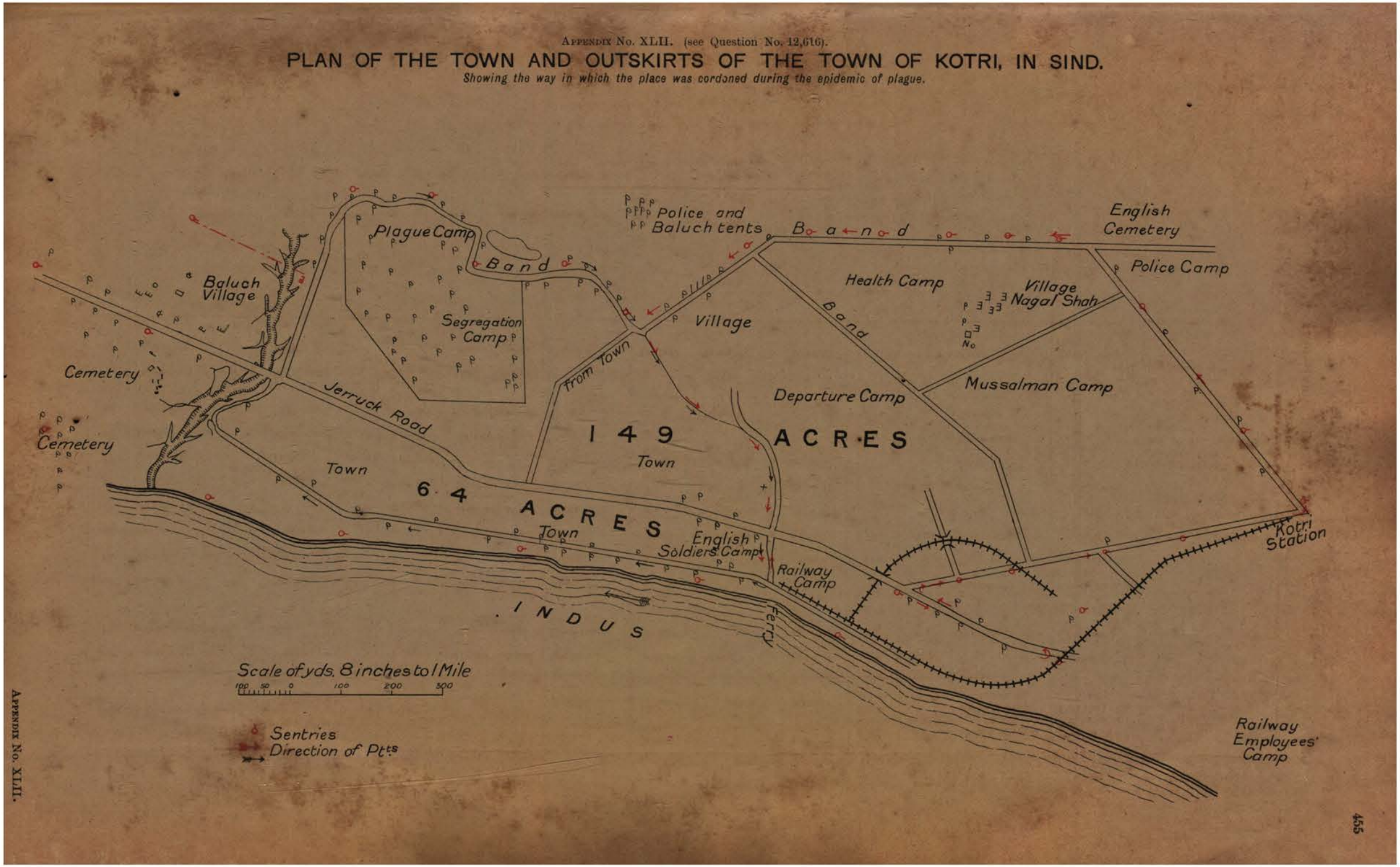
19	Punja, wife of - -	Jetho - -	35 years	Hindu Nassarpuri	Grocer -	17 days	Bronchitis -	7.10.97	No	Yes	Wasand -	Local resident.		
20	Achar - -	Iso - -	40 „	Muhammadan Manjhand.	Drummer -	20 „	Cystitis -	7.10.97	Yes	„	Achur - -	„		
21	Pohu - -	Nathu - -	30 „	Hindu Nassarpuri	Peon distillery	7 „	Broncho-pneumonia.	8.10.97	No	„	Nathu - -	„		
22	Rocha, daughter of -	Khoto - -	9 „	„ „	Cloth seller -	9 „	Paralysis -	11.10.97	„	„	Khoto - -	„		
23	Chandu - -	Ramamal - -	15 months	„ „	„ -	1 month	Teething -	11.10.97	„	„	Visumal -	„		
24	Daughter of - -	Mahikhan -	—	Muhammadan Abro.	Herdsman -	—	Still-born -	12.10.97	„	„	Could not be found.	- - -	Born in Nangashah's village.	
25	Jahanshah - -	Ahmedshah -	5 years	Muhammadan Sayad.	Domestic servant.	21 days	Fever - -	13.10.97	„	„	Ahmed Shah -	12 or 13 years.		
26	Lekhu - -	Rochi - -	40 „	Hindu Lohana	Coolie - -	3 months	Diarrhœa -	13.10.97	Yes	„	Rochi - -	3 months.		
27	Darumal - -	Asudomal - -	33 „	„ „	Grain seller -	3 days	Dysentery -	14.10.97	„	„	Hiro - -	Local resident.		
28	Allah Bachayo - -	Harun - -	9 months	Muhammadan Mohana.	Coolie - -	20 „	Teething -	15.10.97	No	„	Could not be found.	Could not be found.	Died in Nangashah's village.	
29	Chandan - -	Manik - -	35 years	Hindu Khudabadi.	Dealer in sundries.	12 „	Fever - -	17.10.97	Yes	„	Saman - -	Local resident.		
30	Akbar - -	Abdul Khalik -	6 months	Muhammadan Pathan.	Procurer -	20 „	Abscess -	18.10.97	„	„	Abdul Khalik -	5 years.		
31	Chatta - - -	Abdul Ruf - -	5 „	Muhammadan Mohana.	Boatman -	10 „	Convulsion -	18.10.97	No	„	„ -	„ -	Died in boat which made fast at the bank for the night.	
32	Begum, daughter of -	Jaro - -	28 years	Muhammadan Machi.	Sweeper -	3 months	Consumption	18.10.97	Yes	„	Jaro - -	Local resident.		
33	Khudabaksh - -	Nazar Mahomed -	7 months	Muhammadan Mulo.	Teacher -	15 days	Dysentery -	19.10.97	No	„	Nazar Mahomed	„ -	Son of, and same house as, No. 10 of this statement.	
34	Rochalbai, wife of -	Kewal - -	45 years	Hindu Nassarpuri	Grocer - -	10 „	Quinsy -	19.10.97	Yes	„	Kewal - -	„ -	Same house as No. 21 related.	
35	Bachi, daughter of -	Aloo - -	8 „	Muhammadan Mohana.	Boatman -	14 „	Fever -	20.10.97	No	„	Aloo - -	„ -	Died at river bank. Not related to others in this statement.	
36	Haji - - -	Rahdino - -	26 „	„ „	„ - -	10 „	Fever, congestion of brain.	22.10.97	„	„	Rahdino - -	1½ months.		
37	Ahmed Khan - -	Izatkhan - -	18 „	Muhammadan Memris.	Cultivator -	8 „	Fever and congestion of brain.	23.10.97	Yes	„	Malik Sohdor Khan.	- - -		
38	Mehrban - -	Unknown - -	60 „	Muhammadan Punjabi.	Coolie - -	6 „	Old age and dysentery.	25.10.97	„	„	Unknown -	Came from Bussreh one month previously.		
39	Lachmi, wife of - -	Khoto - -	30 „	Hindu Nassarpuri	Broker -	3 „	Abortion -	25.10.97	No	„	Khoto - -	Local resi dent	Same house and mother of No. 22 of this statement.	
40	Gangu - -	Akhio - -	45 „	„ „	Goldsmith -	3 „	Fever - -	25.10.97	„	„	Gangoo -	„ -		
41	Daya daughter of -	Nathu - -	10 „	Hindu Khati	Dyer - -	6 „	„ - -	26.10.97	„	„	Nathu - -	„		

No.	Name of Deceased.	Father or Husband's Name.	Age.	Caste.	Occupation of Males.	Period of Illness.	Cause of Death.	Date of Death.	Under Medical Treatment.	Examined after Death.	Name of Head of House in which Death occurred.	Period of Residence of Deceased at Kotri.	Remarks.
42	Topan - -	Mengho - -	28 years	Hindu Lohana	Coolie -	9 days	Fever - -	26.10.97	No	Yes	Teco - -	6 months.	
43	Suhni, daughter of -	Mehar - -	9 months	Muhammadan Gado.	Herdsman -	3 „	„ - -	26.10.97	„	„	Mebar - -	Chandwari Paro beyond main station.	
44	Imdad - -	Chokar - -	18 years	Muhammadan Chandio.	Fireman -	6 „	„ - -	27.10.97	„	„	Chakar - -	Local resident.	
45	Vensi - - -	Kundan - -	18 „	Hindu Lohana	Coolie -	4 „	Congestion of brain.	28.10.97	Yes	„	Naroo - -	„	
46	Rakhio - -	Unknown - -	60 „	Muhammadan Malbi.	Fireman -	1 month	Diarrhœa -	28.10.97	No	Yes	Unknown -	Unknown -	Died in Nangashah's village.
47	Mamoo - -	Gul - -	8 „	Muhammadan Chandio.	Boatman -	1 „	Congestion of brain.	28.10.97	„	„	„ - -	„ -	Died in Mahomedshah's tando.
48	Muli, wife of - -	Khanu - -	30 „	Hindu Lohana	Confectioner -	3 days	Delivery -	28.10.97	„	„	Pohoo - -	Local resident.	
49	Cheeta, daughter of -	Tolo - -	1 month	„ „	Tinner - -	16 „	Diarrhœa -	28.10.97		„	Jetho - -	„ -	Daughter of No. 46 of this statement.
50	Tilee, daughter of -	Khanchand -	7 months	Hindu Sahto	Peon - -	12 „	„ -	29.10.97	„	„	Bhawandar -	„ -	Close to No. 4 of this statement.
51	Tahilram - -	Pahlajrai - -	40 years	Hindu Brahman	Brahmin -	12 „	Fever - -	29.10.97	Yes	„	Pesusing - -	„ -	The only possible connexion was, this man was a beggar.
—	Jammuram - -	Haninoram - -	20 „	Hindu Punjabi	Reviewing clerk	—	Plague -	29.10.97	„	No	- - -	- - -	The first plague case of the second epidemic.
52	Bachi, wife of - -	Kauro - -	70 „	Muhammadan Punjabi.	Boatman -	18 days	Fever - -	30.10.97	„	„	Kowro - -	Local resident.	

Appendix No. XLII. (see Question No. 12,616).

PLAN OF THE TOWN AND OUTSKIRTS OF THE TOWN OF KOTRI, IN SIND.

Showing the way in which the place was cordoned during the epidemic of plague.



Appendix No. XLIII.

APPENDIX No. XLIII.

(*See* Question No. 13,297.)

NOTES BY DR. NAZARETH AND REPORT BY DR. SIMOND,

REGARDING

CASES OF PLAGUE TREATED WITH ROUX' SERUM IN KARACHI IN MAY AND JUNE, 1898.

NOTES BY DR. NAZARETH.

308.—Rutoo Ooger. Admitted on 11th May. Had a bubo in the right groin and a carbuncular wound in the right ankle. He also had a marked icteric appearance. He was a severe case from the beginning. His general condition was typhoid, his temperature was never high, being only 100° on admission and varying between 100° and 100·6° during the period he was alive. He received three injections of serum, one on the evening of the 11th, and two the next day (at 10 a.m. and six p.m.). There was no appreciable effect.

317.—Chela Hemoo. Admitted on the night of the 12th May. Had a bubo in the left groin. 13th, Temp. M. 103°. Received an injection of 40 c.c. of serum at 10 a.m. Temp. E. 102°. Second injection given. 14th, Temp. M. 102°, E. 102°. Third injection administered 15th, Temp. M. 100·4°, E. 101·6°. Pulse, tongue, and general condition greatly improved, pain in the bubo decidedly less.

16th, Temp. M. 100·4°, E. 101·4°.
17th, ,, M. 102°, E. 102°.
18th, ,, M. 100°, E. 100°.
19th, ,, M. 100°, E. 100°.
20th, ,, M. 99°, E. 100°.
21st, ,, M. 98°, made an uninterrupted recovery subsequently.

322.—Manbai Jethanand. An elderly plethoric Brahman woman was admitted to hospital on the evening of the 14th May after visiting hours. She was a severe case and unconscious on admission. On morning of 15th her temperature was 101·4°. The first injection of 40 c.c. was administered. Temp. E. 104°; second injection given. 16th; Temp. M. 103°, E. 103·8°; no improvement; third injection administered. 17th, Temp. M. 104·2°, E. 105°. Died the following morning. No bubo was detected.

325.—Lukoo Hemon. Admitted on evening of 16th May. Comatose and delirious. Received two injections on 17th. No effect. Decidedly worse. Died on the morning of the 18th. Temp. 16th, E. 103·2°; 17th, M. 104°, E. 104·4°.

326.—Peara Mukunchand. Admitted on 16th May. Temp. E. 103·2°. Comatose. Received one injection of 40 c.c. No effect. Died the same evening. He had no bubo.

336.—Bussa Rupoo. Admitted on evening of 18th May. Temp. 19th M. 103·2°, E. 101°. Received two injections during the day, was much improved by the evening, pain in the bubo less. 20th, Temp. M. 100°, E. 99·2°; 21st, Temp. M. 101°, E. 101°; 22nd, M. 100°, E. 104°. Symptoms of pneumonia evident. Expectoration sanguineous. Died suddenly on 23rd.

340.—Dunnoo Namori. A very mild case. Admitted on 19th. Temp. M. 101°, E. 100°. Received two injections. Temp. 20th, M. 99°, E. 99°. 21st, Temp. normal, received no further treatment. This was a case that had been previously inoculated with Haffkine's prophylactic and was a mild one from the outset. It was only after administering the second injection that we learnt he was an inoculated case, else we should not have tried the serum treatment.

350.—Jeewabai Lalloo. Admitted on 21st May. Was a severe case. Temperature on admission 103·8°. Received an injection of 20 c.c. the same evening. 22nd, Temp. M. 101·4°, E. 102°. Received a second injection of the same quantity in the morning. General condition improved. Pain in bubo less. 23rd, Temp. M. 101°, E 102°. 24th, M. 102°, E 104°. Pain in bubo returned. Another injection tried. 25th, Temp. M. 100°, E. 102·4°. Symptoms of suppuration of glands setting in. The fever gradually subsided and the bubo was opened on 28th, after which the temperature became normal. Her long stay in hospital is attributed to her not being permitted to leave the hospital until the wound was throughly healed, although she was walking about the yard a few days after the bubo was opened.

354 and 355.—Mugoobai Soojun and Lukmibai Lalljee. Were both very severe cases. They were discovered in a chawl (tenement house) occupied mostly by sawyers. From their general condition they appeared to be comparatively old cases. Lukmibai Lalljee's temperature on 22nd was 105°. She was injected the same evening. On the 23rd Temp. was, M. 103°, E. 104·4°. The injections were again given morning and evening. No effect. She died on the morning of the 24th. She never rallied. Mugoobai Soojun, who was admitted at the same time as Lukmibai, was a similar case. Her temperature on admission was 102° F, and she was comatose. She was injected on the evening of the 22nd May (first injection). Temp. next day, M. 100°, E. 101°. Received the second and third injections this day. Considerable improvement was noticed, became conscious and replied to questions rationally, the tongue, which was brown and dry on admission, was now moist. On the 25th the temperature was M. 99°, E. 100°. It became normal on the 27th, after which an uninterrupted recovery was made, the bubo subsiding.

356.—Nanchand Nuthoo. Admitted on 22nd May. Temp. 104°. Injected with serum the same evening. On 23rd temperature was, M. 100·6°, E. 103·4. Received second injection on evening of the 23rd. 24th, Temp. M. 98°, E. 99°. Much improved. The pain in bubo greatly reduced. Apparently convalescent. 25th, Temperature again rose to 104° F. Symptoms of pneumonia evident. Received the third injection. Temp. E. 104°. Respiration troubled. Sputum characteristic. 26th, Temp. M. 102°, E. 103°; 27th, Temp. M. 103°, E. 103·8°. Died. This was another case in which the effect of the serum was marked; were it not for secondary pneumonia supervening the patient might have made a rapid recovery.

357.—Laljee Pancha. Admitted on 22nd May, Temp. 104°. Received an injection the same evening. 23rd, much improved, both in general and local symptoms. Received a second injection. Temp. M. 100°, E. 102·2°; 25th, Temp. 101·4°, E. 102°; 26th, M. 102°, E. 103°. General symptoms worse, pain in the bubo returned, the tongue brown and dry. Received a third injection this evening. Temperature on 27th M. 102°, E. 102·4°. Slight improvement. 28th. Fresh relapse, patient semi-comatose, was delirious the whole night. Temp. M. 103°, E. 104·2. Died next morning.

358.—Kheta Pacha. Admitted on 22nd May. Was a severe case. Received three injections. Temperature which was 103° on admission rapidly fell and was normal on the 27th. After a few days it again rose (on 2nd June) to 101·6°, and kept between 100° and 101° for a few days with symptoms of local suppuration, until the abscess was opened on the 5th June, after which the patient made a rapid recovery.

359.—Pritum Dalla. Was a severe case. Nervous symptoms predominant. The patient excitable and delirious. He received three injections of serum, but without any appreciable effect.

23rd, Temp. M. 103°, E. 101°. First and second injections given.
24th, Temp. M. 102°, 103 6°. Third injection given.
25th, ,, M. 101°. Died in the afternoon.

361.—Seogan Manda. Admitted on May 23rd. A severe case, though conscious. Temp. 104·8°. Received *first injection* (evening).

24th, Temp. M. 100°, E. 103·8°. Second injection administered (morning).
25th, Temp. M. 101°, E. 104·2°. Third injection administered (evening).
26th, Temp. M. 101°, E. 99°.
27th, „ M. 100°, E. 101.
28th, „ M. 102°, E. 102°. Symptoms of suppuration of affected glands.
29th, Temp. M. 101°, E. 102°.

The temperature varied from 99° to 101° for a few days until 3rd June, when the abscess was opened. This patient had rather a lingering convalescence.

362.—Maojee Runchore. Admitted on 23rd. Semi-conscious. Delirious at night. Temp. E. 103°. Received first injection.

24th, Temp. M. 98·4°, E. 99°.
25th, „ M. 98·4°, E. 101. Received second injection.
26th, Temp. M. 102°, E. 103. Signs of commencing suppuration.
27th, Temp. M. 101°, E. 101·4°.
28th, „ M. 100°, E. 101°.

The bubo was opened early, as symptoms of sloughing were apparent. This patient also had a very lingering convalescence, as the wound resulting from the sloughing of the tissues around was very slow in healing.

363.—Kutchra Narayen. A favourable case.

24th, Temp. M. 100°, E. 102°. First injection.
25th, „ M. 103°, E. 103·4°. Second injection.
26th, „ M. 98°, E. 101·2°.
27th, „ M. 98°, E. 99·2°.
28th, „ M. 98°, E. 98°.

The temperature remained normal for a few days until the 2nd June, when symptoms of suppuration set in with slight rise of temperature. The abscess was opened on the 6th, after which an uninterrupted recovery ensued.

364.—Dhuramdass Sobhraj. Was admitted in hospital on 24th May. His case was detected by me in my private practice on the 23rd inst., at night, and he was one of the inmates of a house, all the members of which were inoculated with Haffkine's prophylactic, except himself. All the others escaped infection. At my request he was injected with Roux serum on the morning of the 24th at his own residence before removal to hospital. This was a severe case of plague. In this instance the effect of the serum treatment was also very marked. A second injection was given the same evening in hospital. The pain in the bubo had almost disappeared, and the general condition was greatly improved. This was one of the first cases in which I noticed severe pains in all the joints, simulating rheumatism, occurring as a result of the injection of large doses of the serum of the horse. A third injection was administered on the morning of the 26th. It was then that the rheumatoid symptoms were first detected. Beyond these joint pains causing him a certain amount of inconvenience, this patient made a good recovery subsequently.

24th, M. 99·4°, E. 100°.
25th, M. 100°, E. 103°.
26th, M. 103°, E. 101°.
27th, M. 99·8°, E. 101·4°.
28th, M. 100·6°, E. 106·6°.
29th, M. 99·4°, E. 100°.
30th, M. 98·2°.

I had occasion to follow up his case subsequent to his discharge from hospital. After about a month he experienced symptoms of paresis of the lower extremities with tremor of most of the muscles of the body. This left him after about three weeks. Since then, up to the time I left for Europe, he was suffering from general nervous symptoms of various kinds.

366.—Dhallo Saman. Admitted on May 24th. Appeared a comparatively a mild case. Temperature E. 101°. Received an injection of serum the same evening. 25th, much improved. Temperature M. 98°. E. 101°. Received the second injection. Appeared this evening to be suffering from some kind of delusion that the police were to arrest him, and tried to escape from hospital. Was discovered and brought back to the wards. He was inclined to be violent and had to be strapped down to his bed, and a special attendant kept in charge of him. 26th, appeared quieter. The temperature was normal during the whole day. On the morning of the 27th, the dead body of this patient was discovered in an orchard some 200 yards away, hanging by the neck from a tree. He utilised for that purpose the bandages that were applied over his bubo.

367.—Mooloo Tukoo. Admitted in hospital on the 24th May. Was a severe case. His temperature on admission was 104·4°. Received the first injection. His general condition had somewhat improved next morning. Temperature on 25th, M. 101·4°, E. 103°. Received a second injection on the evening of the 25th.

26th, Temp. M. 102°, E. 103°. Received the 3rd injection.
27th, Temp. M. 98·4°, E. 101°.
28th, „ M. 98·4, E. 99°.

He now began, *i.e.*, after the third injection, to suffer from rheumatoid pains all over the body. These symptoms lasted about ten days, after which although practically cured and the inflammation of the glands arrested, he was too debilitated to be discharged from hospital. He had rather a lingering convalescence.

368.—Muggan Huroo. Admitted on 24th. Temperature 104°. Received the first injection the same evening. 25th, passed a restless night. Delirious and semi-comatose. Temp. M. 101°, E. 104·4. Second injection administered. No effect. Nervous symptoms worse. Coma increasing. Third injection administered in the evening. 26th, Temp. M. 103, E. 104. Ineffective, the patient evidently sinking. 27th, died in the early morning.

371.—Kumkoobai Mowjee. Admitted into hospital on 25th, a comparatively fresh case. Temperature the same evening, 102°. Received the first injection. 26th, Temp. M. 100°, E. 100°. Received second injection at 10 a.m. General condition much improved, pain in bubo subsided. 27th, Temp. M. 98°, E. 100°. 28th, Temp. M. 98°, E. 99°. 29th, Temp. normal.

381 and 382.—Hassan Allana and Mahomed Hassan, two policemen of the mounted corps. These were two of ten policemen who were all infected in the same house, all of whom died within a comparatively short period. Both of the above-mentioned—men who were under my observation — were typically virulent cases, more of the asthmic type. They both had all the symptoms of pneumonic plague, and although both received two full doses of serum each, the effect was *nil*. No. 381 died the day after admission. No. 382 died the same evening.

383.—Prema Kanaya was a comparatively severe case.

29th, Temp. M. 103°, E. 102·2°. Received first injection of serum.
30th, Temp. M. 103°, E. 102°. Second injection given in the morning. Pain in bubo less.
31st, Temp. M. 101°, E. 100°. Much improved.

This patient also suffered from rheumatoid pains. The temperature fell to normal on the 1st June, but joint pains rendered him bedridden for about a week, thus prolonging the period of convalescence.

387.—Gulalibai Vishna. Admitted on 30th May. Was a mild case.

30th, Temp. M. 100°, E. 101°. Injected with 20 c.c. of serum.
31st, Temp. M. 98·8°, E. 99·4. Received second injection (20 c.c.)
1st June, Temp. M. 98.6, E. 99.

Made an uninterrupted recovery afterwards. The pain in the affected glands returned, and it looked as if the bubo would suppurate. It eventually subsided completely, without suppurating.

390.—Subharam Thaooram, a railway clerk, was admitted in hospital on June 1st. Was an old case. From the history elicited, about 10 days had elapsed before it was correctly diagnosed as a case of plague. His general condition was low. Temp. M. 103°, E. 102°. Dr. Simond did not wish to inject him with the curative serum, considering the case too old for the serum to produce a beneficial effect; but at the very special request of the patient he received three full dose injections, without, however, any appreciable effect. Temp. 2nd June M. 101°, E. 102·4°.

3rd, Temp. M. 102°. Died during the day.

391.—Vigibai Daya, a little five-year-old child, belonging to the goldsmith caste. Admitted on June 1st. Temp. M. 101·4°, E. 103°. Drowsy and fretful. Received two injections during the day of 10 c.c. each.

2nd, Temp. M. 101°, E. 102°. Third injection administered.
3rd, Temp. M. 100°, E. 99.
4th, „ M. 98°, E. 99.
5th, „ M. 98°.

The improvement in the child was noticed after the 2nd injection. This was another rapid case of cure. The child was to have been discharged early from hospital, when symptoms of suppuration in the bubo were detected. The abscess was opened, and the child discharged from hospital as soon as the wound healed

392.—Pamanmall Shamidass. A severe case. Admitted on 1st June. Temp. 104°. Unconscious. Typhoid symptoms. Received 1st injection of 20 c.c.
2nd June, Temp. M. 102°. Received second injection. E. 101°. Conscious. Pain in bubo less.
3rd, Temp. M. 101°, E. 103·4°. Third injection of 20 c.c. administered.
4th, Temp. M. 100°, E. 101°.

Showed rheumatoid symptoms, which were rather severe, and lasted about ten days. These weakened the child a great deal, and when these pains subsided the temperature, which ranged between 99° and 100° daily, again rose on the 14th June to 102·4°, and signs of suppuration in the glands appeared. After a few days' poulticing, the abscess was opened. This boy had a lingering convalescence, as it took a long time for the wound to heal thoroughly.

394 and 397.—Budai Seodin and Kanianat Kulloo were both severe cases, with high fever and typhoid symptoms, and pneumonia. The former received two injections, but died the next day. The latter had three injections, but they proved perfectly ineffective.

395.—Oomer Ebrahim was the only case of plague pneumonia in this hospital that recovered. On admission the temperature was 104·4°. First injection given.
3rd June, Temp. M. 102°, E. 102°. Second injection given.
4th, Temp. M. 100°, E. 102°. Third injection given.
5th, „ M. 104°, E. 104·8°.

Symptoms of pneumonia detected. The patient comatose. Was apparently a hopeless case. After a few days he rallied, and improved under stimulant treatment and careful nursing. The pains in the affected groin returned after a few days, ending in suppuration and sloughing of the adjacent tissues. The whole chain of glands sloughed, and were removed piecemeal. It took a long time for the wound to fill up and heal.

398.—Krishna Vithoo. Admitted on June 3rd. A severe case. Arrived in hospital in an unconscious state. Typhoid symptoms marked. Temp. 104°. First injection given.
4th, Temp. M. 104°. Second injection administered. Temp. E. 103°. Third injection given. No improvement.
5th, Temp. M. 103°, E. 103·6°. No improvement apparent.
6th, Temp. M. 104°, E. 104·6°. Decidedly worse.
7th, „ M. 104°. Died during the day.

399.—Mugabai Tatia. Admitted on the 3rd June. Died on 5th June. A very severe case. Unconscious on admission. Never regained consciousness. Temp. 103°. Received first injection of 15 c.c. the same evening.
4th, Temp. M. 103°. Second injection given. E 103·4°. Third injection given.
5th, Temp M. 104°. Died during the day. No effect.

401.—Dayobai Jeyram. Admitted June 4th. A severe case. Received one injection of 10 c c. of serum. No effect. Died the same evening.

403.—Budhoosing Narayansing. Admitted on 5th. Temp. E. 104·4°. Semi-conscious condition. Typhoid symptoms prominent. First injection administered.
6th, Temp. M. 103°, E. 104°. Received two injections this day. No improvement.
7th, decidedly worse. Temp. M. 103°, E. 103·6. Unconscious.
8th, Temp. M. 102°, E. 103°.
9th, „ M. 102°, E. 102°. Sinking.
10th, died in the early morning.

404.—Atmaram Daji. A severe case. Temp 5th, 104°. Received the first injection.
6th, Temp. M. 103°, E. 105°. Second and third injections given. Symptoms of pneumonia evident.
7th, Temp. M. 102·8°, E. 104°. Decidedly worse.
8th, died in the early morning.

409.—Liberata D'Souza Was a severe case Being my private patient, I had her taken in hand at an early stage, with beneficial results from the serum treatment. She was admitted in hospital on the 6th June, the 3rd day of the disease. Temp M. 103°, E. 103·4°. Received this day two injections of 20 c c. each. June 7th, better. Temp. M. 102°, E. 102·4°. Third injection given. 8th, much improved. Pain in bubo less. The temperature now ranged between 99° and 100° for a few days, when on the 18th June the pain in the original bubo returned, and new ones were noticed on both the groins. The general condition was not, however, any way markedly worse. This girl had also suffered from rheumatoid pains after the third injection Her temperature continued above normal for a time, and the buboes threatened to suppurate, but by poulticing and judicious treatment and nursing they all subsided.

V. E. NAZARETH, M.D., L R.C.S., etc.
29th August 1899.
London.

REPORT BY Dr. SIMONDS.

To the SECRETARY TO THE SURGEON-GENERAL with the GOVERNMENT OF BOMBAY, Bombay.

I have the honour to communicate to you the details of cases of plague treated by me at Karachi from 9th May to 6th June 1898, with the serum prepared by Dr. Roux at the Pasteur Institute at Paris.

My results are not such as to enable me to declare them satisfactory and the serum capable of curing with certainty the plague. However, they are valuable inasmuch as they show a considerable progress accomplished since last year in the efficacy of the serum.

In the hospitals at Karachi I injected by preference, on every occasion, patients who had been less than four days sick, even when they appeared at the point of death. I, however, injected whenever I was asked persons in a dangerous condition who had been ill for more than four days. It follows, then, that the number of patients in a hopeless condition who were treated is considerable. This is not an important point. I think that it is principally on the nature of cases treated and not on statistics which the chance of circumstances can make more or less good that one ought to base one's estimation of the value of the treatment. Some people might believe that I prefer to inject fresh cases because they have more chances of natural recovery; this is a great mistake, and it is only necessary to consult the statistics of the hospital to see that the greatest mortality always occurs among patients admitted on the first three days. Experience has proved to me that the serum is injected in those admitted to hospital after the period has passed, an excellent proportion of success will be obtained, but one cannot with certainty attribute it to the treatment.

At Karachi I was not successful with the cases of more than three days' standing, because, in the first place, I injected only serious cases, and secondly, the action of the serum at this period is very doubtful, as the results show. Success in the treatment of serious cases has been obtained exclusively amongst fresh cases.

The recoveries in the cases of pneumonia, primary or secondary, are exceptional. It seems to me that we can only intervene with advantage in this form of plague after the anti-toxic and bactericidal action of the serum has been increased in a great proportion. The tissue of the lungs is eminently favourable to the development of the microbe. It offers to it an immense surface for the culture and absorption of the toxin. Besides, the difficulty in breathing diminishes the resistance of the organism in such a way that the patient succumbs sometimes, after the symptoms of intoxication have disappeared, only because of the mechanical trouble which persists.

The proportion of pneumonic cases treated has been considerable (16 in 75 cases), because I treated those who presented themselves without yet being in a moribund condition, with a view to studying the value of the treatment in this form of plague, and because the families asked me to treat a great number of persons whose state was absolutely hopeless.

These are the numbers (figures) of the cases treated, with the proportions of cures and deaths for the different categories:—

1st.—General Figures.

Treated	75
Completely cured	38
Still under treatment, of whom the most part are in a fair way to recover	7
Dead	37

2nd.—Cures with regard to the Severity of the Cases.

(Attacks).

Bubonic cases, very severe, cured	12
„ severe	13
„ slight (mild)	6
Pneumonic cases appearing to be in a fair way to recover, still under treatment	3
Bubonic cases, very grave, still under treatment, apparently in a fair way to recover	2

3rd.—Deaths with regard to the Form of Plague.

Pneumonic cases	13
Cases without buboes or pneumonia	3
Pneumonic cases still under treatment, but which will probably end in death	2

Among the deaths there are 12 cases injected in a dying state.

4th.—Recoveries and Deaths among the Bubonic Cases with regard to the Standing of the Diseases.

Bubonic Cases.	Treated.	Cured.	Dead.
First day	5	4	1
Second day	22	14	8
Third day	14	9	5
Fourth day	6	2	4
Fifth day	2	.	2
Sixth day	1	.	1

Out of 41 bubonic cases treated on the first three days 27 recovered, and 14 died. Out of nine bubonic cases treated after the third day, two recovered and seven died.

The conclusions to be drawn from these figures are the following:—

1st. The treatment has proved useful specially in the bubonic form.

2nd. The efficacy of the treatment appears to be very great when the disease has not gone beyond the third day. It is very feeble or dull after the third day.

I have thought it necessary to attach to this rapid account of my operations (work) a list of all the patients treated, with particulars of the principal symptoms which they presented at the beginning of the treatment. One can form a correct idea of the gravity of the cases treated by the particulars which accompany each name.

I have, &c.,
(Signed) D. L. Simond,
Médecin de 1ière Classe du Corps de Santé Militaire des Colonies,
Directeur de l'Institut Pasteur de Saigon.

I.—Plague Cases Treated with the Serum and Cured.

1st.—Very Grave Cases; the Prognosis before the Treatment seemed Fatal.

Serial No.	Name of the Hospital.	Name and Age of the Patient.	Day of the Disease.	Date of the Treatment.	Character and Principal Symptoms of the Disease at the Moment when the Treatment began.
1	Vishandas	Prittibai, 25 years	2	11th May	Left axillary and right inguinal buboes. Fever, 104°·5. Vomitings. Delirium.
2	„	Vatoo, 30 years	3	„	Left inguinal bubo. Fever, 104°·3. Agitation. Congestion of the face.
3	„	Shela, 17 years	3	12th May	Right inguinal bubo. Fever, 105°·2. Comatose state.
4	„	Damon, 6 years	2	13th May	Right axillary bubo. Profound stupor. Fever, 104°·2.
5	„	Magan, 48 years	1	21st May	Right cervical bubo, extremely painful. Fever, 105°.
6	„	Mangabai, 23 years	2	22nd May	Inguinal buboes, right and left. Stupor verging on comatose. Fever, 104°.
7	„	Darandas, 42 years	2	25th May	Right inguinal and right femoral buboes. Agitation. Fever, 105°. Congestion of the lungs.
8	„	Manji, 40 years	2	24th May	Right inguinal bubo, very bulky. Stupor. Delirium. Fever, 103°·2.
9	„	Prama, 30 years	3	29th May	Right axillary bubo. Fever, 103°. Very great stupor.
10	Civil	Magenmal, 20 years	2	13th May	Right inguinal bubo, extremely painful. Stupor. Mutism. Face contracted and grinning. Fever, 103°·5.
11	„	Shiwatassing, 45 years	2	14th May	Left inguinal bubo. Agitation and difficulty of speech. Fever, 104°.
12	„	Mervanjee, 20 years	2	19th May	Right inguinal bubo, very painful. Delirium. Convulsive movements. Fever, 104°·2.

2nd.—Severe Cases of which the Prognosis at the beginning of the Treatment is very Serious, but leaves some Hope of Recovery.

13	Vishandas -	Prittabai, 16 years -	2	19th May -	Left inguinal bubo. Stupor. Fever, 103°·1.
14	„ -	Givabai, 12 years -	2	21st May -	Right inguinal bubo. Broncho-pneumonia. Fever, 103°·9.
15	„ -	Kelta, 30 years - -	2	23rd May -	Left inguinal bubo. Fever, 104°.
16	„ -	Kachra, 15 years -	1	24th May -	Right axillary bubo. Fever, 103°·5.
17	„ -	Kankoobai, 25 years -	2	24th May -	Left inguinal bubo. Fever, 103°·6. Bronchitis.
18	„ -	Moloo, 48 years - -	3	25th May -	Right inguinal bubo. Fever, 104°·4.
19	„ -	Vigibai, 4 years - -	1	1st June -	Right axillary bubo. Fever, 103°·4.
20	Dufferin -	Mr. Patel, 40 years -	1	30th May -	Right inguinal bubo. Fever, 105°.
21	Vishandas -	Kondun, 46 years -	3	4th May -	Right sub-maxillary bubo. Fever, 101°.
22	„ -	Chutteebai, 8 years -	3	26th May -	Right cervical bubo. Fever, 103°.
23	Civil -	Issak Ludha, 36 years -	3	13th May -	Left inguinal bubo. Stupor. Fever, 101°.
24	Vishandas -	Libratta, 11 years -	4	6th June -	Left axillary bubo. Fever, 103°.
25	Dufferin -	Daisy Jerome, 6 years -	1	2nd June -	Right axillary bubo. Fever, 104°.

3rd.—Slight Cases which seemed at the beginning of the Treatment to be likely to end in Recovery.
(" Mild cases " of the English Physician.)

26	Vishandas -	Dunna, 10 years -	2	19th May -	Right inguinal bubo.
27	„ -	Kimot, 9 years - -	5	„ -	Right and left inguinal buboes.
28	„ -	Manoobai, 4 years -	2	21st May -	Left axillary bubo.
29	„ -	Dalu, 31 years - -	3	24th May -	Right inguinal bubo.
30	„ -	Gulalibai, 8 years -	4	29th May -	Left inguinal bubo.
31	Civil - -	Budu, 30 years - -	3	20th May -	Right inguinal bubo.

Very Severe Cases still under Treatment, and of which the most Part are in a Fair Way to Recover.

Serial No.	Name of the Hospital.	Name and Age of the Patient.	Day of the Disease.	Date of the Treatment.	Character and Principal Symptoms of the Disease at the Moment when the Treatment began.
32	Vishandas -	Seojan, 25 years -	2	24th May -	Right inguinal bubo. Pulse intermittent. Double pneumonia with hemoptysis. Fever, 103°·3. This patient seems at present to be in a fair way to recover after having remained during 14 days in a hopeless state.
33	„ -	Pamanlal, 9 years -	3	1st June -	Right cervical, right inguinal and left inguinal buboes. Double pneumonia. Fever, 104°. This patient is not yet out of danger, but his state has greatly improved. He will probably recover.
34	„ -	Domer, 18 years -	3	2nd June -	Right inguinal bubo. Double pneumonia. Fever, 104°. Vomitings. This patient appears to be at present in a fair way to recover.
35	„ -	Budoo Singh, 30 years -	2	5th June -	Right inguinal bubo. Gangrenous eschar of the foot with œdema. Fever, 104°. Delirium. This patient appears to be too ill to recover.
36	Manora -	Kewalsing, 14 years -	3	4th June -	Right inguinal bubo, very painful. Agitation. Fever, 104°. This patient appears to be in a fair way to recover on the 8th June, four days after the treatment was begun.
37	„ -	Tadda, 19 years - -	2	„ -	Left inguinal bubo. Congestion of the lungs. Very high fever, 105°. This patient seemed to be in a fair way to recover on the 8th June, four days after beginning the treatment.
38	Borah -	Fatmabai, 12 years -	1	6th June -	Left inguinal ganglion, very painful. Stupor and drowsiness alternating with crisis of agitation and delirium. Congestion of the face. Fever, 104°. I have not seen this patient since the first injection.

II.—Cases of Plague who Died after having received some Injection of Serum.

1st.—Deaths through Plague Pneumonia.

Serial No.	Name of the Hospital.	Name and Age of the Patient.	Day of the Disease.	Date of the Treatment.	Character and Principal Symptoms of the Disease at the Moment when the Treatment began.
39	Civil - -	Osman, 35 years - -	1	13th May -	Primary double pneumonia. No buboes.
40	„ - -	Bhima, 50 years -	3	„ -	Secondary pneumonia. Left axillary bubo.
41	Vishandas -	Lukoo, 36 years -	1	16th May -	Double primary pneumonia with hemoptisis from the very beginning. Inguinal secondary bubo. *This man was injected at the request of his relations, and without any hope of success.*
42	„ -	Soba, 38 years - -	4	„ -	Double primary pneumonia.
43	„ -	Karimbu, 25 years -	2	17th May -	Double primary pneumonia. This man was brought to the hospital *when he was on the point of death.* He died few hours after having received the first injection.
44	„ -	Nanchand, 22 years	2	22nd May -	Right inguinal bubo. Double pneumonia. Cholera from diarrhœa.
45	„ -	Hossam, 40 years -	2	28th May -	Double primary pneumonia. This patient *was injected* at the request of his relatives without *any hope of success.*
46	„ -	Mahomed, 32 years -	2	„ -	Double primary pneumonia. This patient *was injected at the request of his relatives without any hope of success.*
47	„ -	Ismail, 32 years - -	3	30th May -	Left inguinal bubo and secondary pneumonia.
48	„ -	Bodun, 25 years - -	4	2nd June -	Double pneumonia. Left inguinal bubo. *This patient was nearly at the point of death when he was injected. He died few hours after the first injection.*
49	„ -	Kemati 30 years	4	3rd June -	Right axillary bubo, secondary pneumonia.
50	Cutchi -	Sokoor, 23 years -	2	25th May -	Left axillary bubo and secondary pneumonia.

2nd.—Cases without Buboes whose Pneumonia is doubtful.

51	Vishandas -	Manbai, 50 years - -	1	14th May -	No bubo. Complete stupor. Mutism.
52	„ -	Kurman, 32 years -	3	15th May -	This case is probably not one of plague. The patient had been laid up for several months. He had neither buboes nor pneumonia. He was brought to the hospital dying, and injected *at the request of his relatives.*
53	Civil - -	Gunoomal, 50 years	4	12th May -	This patient had no buboes, but high fever (104°) and stupor. *He was injected at the request of his relatives,* and a remarkable improvement took place on the following day. Two days afterwards he died almost suddenly.

3rd.—Cases of Bubonic Plague without Pneumonia who died after having received Injection of Serum.

54	Civil -	Sukdugal, 22 years -	3	12th May -	Right inguinal bubo.
55	„ - -	Massa, 20 years -	3	„ -	Right inguinal bubo. Complete coma. Pulse very feeble. *This patient was almost at the point of death when injected.*
56	„ - -	Narandas, 25 years -	1	18th May	Right inguinal bubo. This patient showed an extremely virulent form of plague. He resisted, however, during 14 days, whereas his wife, attacked in the same manner, and on the same day, died without having been injected with the serum after 48 hours of illness. I attribute the survivorship shown in the man to his having been injected on the first day of the disease.

Serial No.	Name of the Hospital.	Name and Age of the Patient.	Day of the Disease.	Date of the Treatment.	Character and Principal Symptoms of the Disease at the Moment when the treatment began.
57	Civil - -	Kanji, 24 years - -	2	19th May -	Right inguinal bubo. This patient was injected in a dying state. His death took place three hours afterwards.
58	Vishandas -	Ruttoo, 40 years -	3	11th May -	Right inguinal bubo. Gangrene in the foot and œdema in the leg.
59	„ -	Kondanbai, 40 years -	4	„ -	Right inguinal bubo. Vomiting. This woman felt remarkably better after the treatment. She died suddenly of syncope.
60	„ -	Jessibai, 10 years -	4	„ -	Right cervical, sub-maxillary, and left inguinal buboes. *She was injected at the entreaties of her father, and when she was at the point of death, and without pulse.*
61	„ -	Lakmibai, 22 years -	2	22nd May -	Left inguinal bubo with œdema in the abdomen and right inguinal bubo. At the moment she was injected, this woman was in a state of absolute coma which persisted until her death.
62	„ -	Laljee, 35 years - -	2	„ -	Right inguinal bubo. Stupor. Delirium.
63	„ -	Perretom, 40 years -	4	23rd May -	Inguinal buboes to the right and to the left. Gangrenous eschar and œdema in the right foot.
64	„ -	Magan, 15 years -	5	29th May -	Left cervical bubo. Delirium and agitation.
65	„ -	Kalloo, 12 years -	5	26th May -	Right cervical bubo. Delirium. Pulse very feeble.
66	„ -	Sobaram, 29 years -	6	1st June -	Left inguinal bubo, with œdema in the abdomen. *Was injected at the request of his relatives without any hope of success.*
67	Cutchi -	Zulachambai, 85 years -	2	2nd June -	Right axillary bubo. Stupor, unconsciousness. Injected at the request of her relatives. Her advanced age did not allow of any hope of recovery.
68	„ - -	Dimbabai, 20 years -	2	„ -	Left inguinal bubo. Absolute coma which persisted until her death.
69	Vishandas -	Kristna, 26 years -	2	3rd June -	Right inguinal bubo, stupor, delirium.
70	„ -	Moghabai, 7 years -	2	„ -	Right inguinal bubo. Seemed to be taking a favourable turn. Death came suddenly in consequence of vomiting containing intestinal worms.
71	„ -	Daibai, 6 years - -	3	4th June -	Cervical bubo. Was injected when almost on the point of death. Died few hours after.
72	„ -	Piara, 28 years - -	2	16th May -	Right inguinal bubo, stupor, vomitings. Died few hours after the first injection.
73	„ -	Takarci, 18 years -	3	30th May -	Left inguinal bubo. Delirium. Aphasia.
74	„ -	Atmaram, 30 years -	4	4th June -	Right inguinal bubo. Delirium. Agitation.

Two other patients were treated before my departure by Drs Nazareth and Jenney, which brings the total number of the patients injected with serum to 76. I have no certain news concerning the present state of the said new patients.

Bombay, 17th June 1898. (Signed) Dr. G. SIMOND.

APPENDIX No. XLIV.

(*See* Question No. 13,357.)

PAPERS regarding an OUTBREAK of DISEASE in the CUTCH STATE in 1878–79.

No. 74 of 1879.

From Major H. N. REEVES, Political Agent, Cutch, to the ACTING SECRETARY TO GOVERNMENT, Political Department, Bombay.

Cutch Political Agency,
SIR, Bhuj, 6th June, 1879.

I HAVE the honour to submit for the information of Government an original letter from Rao Bahadur the Dewan of Cutch to my address, No. 274, dated 3rd instant, with two interesting enclosures relative to the outbreaks of cholera and fever in this Province during the past year, 1878–79.

2. I believe I am right in saying that within the memory of man Cutch has never experienced such a heavy monsoon or so unhealthy a season as the past.

3. From cholera and fever we have lost upwards of 13,500 persons, the exact figures being:—

Deaths from cholera - - -	1,304
Deaths from fever - - - -	12,344
Total - - - -	13,648

About 100,000 people were attacked with fever, and at one time there was little short of a panic in the country—the price of fuel went up in consequence of the extraordinary quantity used in cremating Hindoos and the grave-diggers raised their rates partly owing to the number of graves they were called upon to dig and partly because their ranks were thinned by fever, which left fewer men to perform the laborious task.

4. In recent census returns the population of Cutch is divided into Hindoos, 303,311, and Mahomedans, 118,063; of these, 71,360 of the former, and 28,543 of the latter were attacked with fever. There is, no doubt, many a poor Hindoo met his death from following a relation or friend to the burning ground, waiting about there, ill-clad either under a burning sun or in an icy cold wind, until the body was consumed, and then bathing in a neighbouring tank or stream, before going home. To a great extent funeral caste feasts were curtailed or postponed to a more convenient season, because people were too ill to enjoy themselves in honour of the dead, or because after a time the price of sugar, wheat, ghee, &c. rose excessively.

5. Repeated attacks of fever searched out the weak point in every one's system, and invalids came to the doctors to be treated for complaints seldom or ever met with in this country. The mortality amongst children was great, and I have been informed that numbers of pregnant women miscarried so that there has been a serious check to the growth of population here.

6. Dr. Dorabji has brought his returns to the end of January only, but as the rainfall was heavy, the Run of Cutch took a long time drying up, and consequently the fever did not by any means disappear in February and March. In fact, I know several instances of patients dying in those months where deaths were directly attributable to fever.

7. As regards cholera, it will be seen that 4,859 persons were attacked, but only 1,304 succumbed to the disease; 625 or nearly half of the above number were males. The epidemic took some little time in reaching Bhuj; but having once obtained a foothold in the city it obstinately withstood the efforts of the authorities to eradicate it.

8. Extra cleanliness, disinfectants, segregation, and other expedients were tried with but partial effect; at last the epidemic seems to die out of itself after repeated plentiful downpours of rain. As will be observed from Dr. Dorabji's statistics, it yielded to medicine in the individual but lingered in the locality; thus in the Central Jail at Bhuj, which is kept scrupulously clean and is continually visited by superior officers of the State—the Dewan, the Doctor, the Assistant Political Agent, and myself included—there were nine fatal cases amongst the inmates, numbering 237, exclusive of the guard and jailers. Here we were in a position to control the diet, clothing, and work of the prisoners, as well as the ventilation and system of drainage, &c., in the jail, and yet it was not until we had on several occasions emptied the building and burnt great fires in different parts of it that the disease abated.

I have, &c.
(Signed) H. N. REEVES, Major,
Political Agent, Cutch.

No. 274 of 1879.

To Major H. N. REEVES, Political Agent, Cutch.

SIR, Dewan's Office, Bhuj, 3rd June, 1879.

AGREEABLY to your suggestion, I have the honour herewith to forward copies of reports submitted by the Principal Medical Officer in the Cutch State, Dr. Dorabji Hormusji, Graduate of the Grant Medical College, Bombay, on the prevalence of cholera and fever in this Province during the last official year 1878–79.

2. Stringent measures were, as you are aware, adopted by the Council of Regency with a view to to check the spread of both diseases and to alleviate the distress caused thereby. Subscriptions were raised by the members of the administration for the suffering poor, and Her Highness, the Maha Ranee Naniba Saheb, and Rana Jalumsingjee, member of the Council of Regency, liberally came forward and supplied medicines and food gratis to a number of people in the town of Bhuj.

3. The effects of the fever were very pernicious to all concerned. The ryots were not able to follow their usual avocations, no labourers were to be had, Darbar offices, schools, and workshops, had to be practically closed, and, in fact, everything was temporarily at a standstill. The fever was unprecedented in the history of the Province, and proved very injurious to the interests of the State.

I have, &c.
(Signed) MANIBHAI, J.,
Dewan of Cutch.

FEVER IN CUTCH IN 1878.

Fever in Cutch is more or less prevalent throughout the year, but it is much more so from September to December. It is generally observed here that the prevalence and severity of fever is in direct proportion to the amount of the rains.

It commences after the cessation of the rains, and, as soon as the soil begins to dry up, it reaches its climax during the season of harvest, and begins to decline after reaping of crops is over. The year 1878 was an exceptional year for rains and fever. The latter began to increase in September, and was greatest in October and November, and began to decline in December and January.

The cases of fever in Bhuj increased to an enormous extent in the month of September, and as one dispensary was not able to meet the wants of the sufferers, two temporary dispensaries were opened in thickly populated parts of the town. Notwithstanding these facilities, there were many who were either unable to get out of their beds, or had no friends to assist them; for such cases a body of police and Municipal peons was kept moving about; they daily visited the houses of the sick, and supplied them with the necessary medicines from the dispensaries.

In the month of December, January and February, while the fever was raging in Bhuj and Abdassa Talukas, it was thought necessary to engage two persons to move about and distribute fever medicines,

and the result of the relief thus afforded is shown by the following table:—

Talukas.	No. of Villages Visited.	No. of Persons Treated.						Result of Treatment.		
		Hindoos.	Mussulmans.	Males.	Females.	Children.	Total.	Cured or Relieved.	Unknown.	Total.
Bhuj Taluka -	15	71	30	58	29	14	101	72	29*	101
Abdasa Taluka	48	408	24	263	198	187	648	71	577*	648

* The result remained unknown, as the two persons engaged for the purpose were moving along.

The cases that were admitted and treated at Bhuj during six months were as follows:—

—	Remained.	Admitted.	Total.	Cured.	Absented.	Died.	Remaining.
1878. August -	19	237	256	163	20	—	73
September	73	1,458	1,531	1,079	105	—	347
October -	347	3,042	3,389	2,200	582	2	605
November	605	2,689	3,294	1,732	666	7	889
December	889	2,007	2,896	2,067	272	3	554
1879. January -	554	1,276	1,830	1,116	166	4	544
Total -	2,487	10,709	13,196	8,357	1,811	16	3,012

From this it will be evident that a sudden rise from 256 cases in August to 1,531 in September had occurred, and their numbers swelled to 3,389 and 3,294 in October and November respectively; some decline took place in December, and a marked decline in January.

During the six months the total number of cases treated amounted to 13,196, or more than the total of the annual number of cases treated in ordinary years. The result of the cases thus treated was that 8,357 were cured, 1,811 absented, 16 died, and 3,012 remained under treatment.

The following tables also show the rise and fall at the Mandvi and Anjar dispensaries in the corresponding months of the year:—

Mandvi Dispensary.

Months.	Received.	Admitted.	Total.	Cured.	Absented.	Died.	Remaining.
1878. August -	70	188	205	160	15	—	30
September	30	395	425	323	24	—	78
October -	78	565	643	489	25	2	127
November -	127	487	614	482	20	1	111
December -	111	316	427	327	8	2	90
1879. January -	90	257	347	277	13	2	55
Total -	453	2,208	2,661	2,058	105	7	491

Anjar Dispensary.

Months.	Remained.	Admitted.	Total.	Cured.	Absented.	Died.	Remaining.
1878. August -	10	103	113	76	10	—	27
September	27	326	353	205	47	1	100
October -	100	417	517	377	56	1	83
November -	83	450	533	297	50	—	186
December -	186	441	627	463	36	—	128
1879. January -	128	204	332	253	9	—	70
Total -	534	1,941	2,475	1,671	208	2	594

It is necessary to show here the close connection which exists between the fall of rain and the cases of fever.

The following table gives the number of fever cases treated from the year 1871 to 1879:—

FEVER CASES.

Months.	1871–72.	1872–73.	1873–74.	1874–75.	1875–76.	1876–77.	1877–78.	1878–79.
August - - -	140	267	184	114	127	128	114	256
September - - -	133	415	242	162	184	161	98	1,531
October -	170	361	238	176	185	225	205	3,389
November - - -	223	394	180	226	167	328	392	3,294
December - - -	363	305	103	251	117	325	547	2,896
January - - -	198	205	91	212	71	241	360	1,830
Total - -	1,227	1,947	1,038	1,141	851	1,408	1,716	13,196

The accompanying table gives the fall of rain in the corresponding years:—

Months.	1871–72.		1872–73.		1873–74.		1874–75.		1875–76.		1876–77.		1877–78.		1878–79.	
	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.	Inches.	Cents.
April - - -	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—
May - - -	3	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
June - - -	—	—	5	92	—	—	3	31	—	2	—	50	—	68	12	66
July - - -	—	—	9	7	3	45	6	81	5	51	3	5½	—	½	14	4
August - - -	8	96	2	68	2	38	1	95	—	46	—	95	—	—	8	81
September - - -	—	—	1	49	—	—	—	15	2	11	1	28½	12	96	4	81
October - - -	—	35	—	—	—	—	—	—	—	—	—	—	1	53½	—	—
November - - -	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	—
December - - -	—	—	—	—	—	14	—	—	—	—	—	—	—	—	—	—
January - - -	—	—	—	—	—	39	—	—	—	—	—	—	—	—	—	—
February - -	—	—	1	10	—	—	—	—	—	—	—	—	—	—	—	—
March - - -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total - -	12	35	20	26	6	36	12	64	8	10	5	84	15	20	40	32

The rise and fall of fever cases exactly tallies with the copious or scanty fall of rain in all the years, with the exception of 1876–77, in which alone the fall was scanty, 5·84 cents, while the fever cases were comparatively more; but this can be thus accounted for that though the fall of rain in Bhuj itself was scanty its fall in the surrounding villages was more plentiful, thus, in Anjar it was 13·6 inches, and in Mandvi 11·59 inches.

The examination of the above tables also shows that when the rains were earlier the intensity of the fever appeared earlier, and when they were late the fever cases also continued late.

As fever was prevalent during the year throughout Cutch, it is necessary here to give some figures which were gathered from the wahiwatdars of the different Talukas.

In Bhuj Taluka 27,146 persons were attacked, of whom 23,350 got cured and 3,796 died; in Anjar Taluka 28,370 cases had fever, of which 25,788 were cured and 2,582 died; in Bhachaoo Taluka the number of persons attacked was 594, of whom 226 were cured and 368 died; in Rapur Taluka 12,430 were attacked, of whom 11,612 cured and 818 died; in Mundra Taluka 14,294 fell sick with fever, of whom 12,893 got well and 1,401 died; in Mandvi Taluka 8,060 were attacked, of whom 6,893 got cured and 1,167 died; in Jakhaoo Taluka 4,243 got fever, of whom 3,809 got well and 434 succumbed; in Lakhpat Taluka there were 1,939 cases of fever, of which 1,234 were cured and 705 died; in Nakhtrana Taluka 1,195 cases occurred, of which 326 cured and 869 died; in Khavda Taluka 1,152 were attacked, of which 1,008 got well and 144 died; in Khudir Taluka 480 persons got fever, of whom 420 got cured and 60 died. Further particulars as to the number of villages attacked in each Taluka, and the sexes and castes of the persons attacked, are given in the Statement No. 1 herewith annexed.

The fever was distinctly of a malarious character, and it commenced to show itself after the cessation of rains. Malaria is believed to be generated under certain circumstances, such as decomposition of vegetable and animal substances under the influence of the heat of the sun; these circumstances had reached a state of perfection in the months of September and October, for as there was already an unusual amount of rainfall, all the tanks were not only completely filled up, but the whole of the province was covered by innumerable swamps and marshes, containing an immense quantity of vegetable and animal substances; the heat of the sun during the rainy season was also unprecedented; in all former years as soon as there were one or two good falls of rains, the heat was considerably moderated and a pleasant good breeze was experienced, but during the last rainy season it was quite the reverse, the heat was as excessive after the rains as it was before them, and it became intolerable after the complete stoppage of the rains. Under these circumstances the malaria generated was general throughout, and was more excessive where the above circumstances predominated, and, as a natural consequence, the people began to suffer from its poisonous effects. In the beginning the type of fever was mild and intermittent in character, and almost all the cases got well under one treatment or another. But as one attack was not an immunity for others, and as malaria was quite rife to attack any that came under its ravages, many people suffered from its attacks repeatedly. Those who were strong and had the means to regain their lost strength during the intervals of attacks got out safely through it, but those who were naturally weak and indigent succumbed under its baneful influence. As the season progressed, the fever assumed a more severe form, and was remittent in character in very many cases; this often implicated very important organs of the body, such as the brain, lungs, heart, liver, and spleen, and, consequently, the mortality was great in such cases. The difficulties of the people had greatly increased when several members of a family were attacked by it at the same time; they were not able to cook for themselves, nor were they able to find servants even at very high wages to cook for them or fetch them water from neighbouring wells.

Besides malaria there were other circumstances which undermined the constitutions of the people. These were the pernicious habits amongst Hindoos of attending funeral parties in their own ways. They were obliged to go out daily with insufficient clothing, and exposing themselves to the heat of the sun indiscriminately, remaining there for a number of hours without any food or water till the dead body was reduced to ashes, and performing ablutions. When they returned home after four or five hours, they usually found themselves very much exhausted, many of them getting in their turn strong headache, vomiting, and fever. This state of things went on till they found themselves unable to move out of their beds.

Thus malaria, excessive heat, pernicious habits in attending the burning of their dead, irregularities in taking food, and, in several cases, insufficient food, all contributed to swell the mortality to a considerable extent.

The fever was not at all of a contagious form, no cases of typhus or typhoid fever were observed.

(Signed) DORABJI HORNMUSJI,
G.G.M.C.,
In charge Civil Hospital,
Bhuj.

City Bhuj,
29th May 1879.

STATEMENT NO. I.

FEVER CASES from SEPTEMBER 1878 to JANUARY 1879 IN CUTCH.

Talukas.	No. of Villages attacked.	Number of Persons attacked.				Number of Persons cured.				Number of Persons died.				Grand Total.	Castes.								Grand Total.
															Hindoos.				Mussalmans.				
		Males.	Females.	Children under 12 Years.	Total.	Males.	Females.	Children under 12 Years.	Total.	Males.	Females.	Children under 12 Years.	Total.		Males.	Females.	Children under 12 Years.	Total.	Males.	Females.	Children under 12 Years.	Total.	
Bhuj Taluka - -	60	9,501	7,556	10,089	27,146	8,325	6,638	8,387	23,350	1,176	918	1,702	3,796	27,146	5,785	5,470	6,272	17,527	3,716	2,086	3,817	9,619	27,146
Anjar - - -	49	10,825	9,444	8,101	28,370	9,254	7,887	8,647	25,788	773	660	1,149	2,582	28,370	6,767	6,254	6,402	19,423	3,073	2,562	3,312	8,947	28,350
Bhachaoo - - -	17	347	167	80	594	142	46	38	226	105	118	45	368	594	312	142	57	511	35	25	23	83	594
Rapur - -	30	4,761	3,969	3,700	12,430	4,506	3,769	3,337	11,612	255	210	353	818	12,430	4,545	3,789	3,468	11,752	216	230	232	678	12,430
Mundra - - -	48	6,013	4,829	3,452	14,294	5,470	4,372	3,051	12,893	543	457	401	1,401	14,294	4,399	3,319	2,389	10,107	1,613	1,510	1,064	4,187	14,294
Mandvi - -	28	3,125	3,730	1,205	8,060	2,748	3,304	841	6,893	377	426	364	1,167	8,060	2,376	2,789	985	6,150	749	941	220	1,910	8,060
Jakhaoo - -	15	1,846	1,326	1,071	4,243	1,700	1,188	921	3,809	146	138	150	434	4,243	1,162	878	719	2,759	684	448	352	1,484	4,243
Lakhpat - -	65	660	562	717	1,939	366	369	499	1,234	294	193	218	705	1,939	471	372	478	1,321	189	190	239	618	1,939
Nakhtrana - -	17	544	455	196	1,195	127	123	76	326	417	331	121	869	1,195	383	352	163	898	161	103	33	297	1,195
Khavda - -	11	440	248	464	1,152	385	217	406	1,008	55	31	58	144	1,152	340	205	105	650	100	43	359	502	1,152
Khudir - - -	7	168	112	200	480	147	98	175	420	21	14	25	60	480	90	62	110	262	78	50	90	218	480
Total - -	347	38,230	32,398	29,275	99,903	33,170	28,011	26,378	27,559	4,262	3,496	4,586	12,344	99,903	26,630	23,582	21,148	71,380	10,614	8,188	9,741	28,543	99,903

(Sd.) DORABJI HORMUSJI, C.G.M.C.

APPENDIX No. XLV.

(*See* Question No. 13,452.)

STATEMENT showing RESULTS of EVACUATION of VILLAGES infected with PLAGUE in CUTCH 1897-99.

No.	Name of Village.	Population, 1891 Census.	Date of First Plague Case.	Date of Evacuation.	No. of Plague Deaths: Before Evacuation.	Within 10 days after Evacuation.	During Remainder of First Month.	During Second Month after Evacuation.	During the Third Month.	Total.	Date of last Case of Plague.	Date of subsequent Recrudescence, if any.	—
					MANDVI TALUKA.								
1	Bada - -	1,400	11 May 1897	15 Oct. 1897	63	1	—	2	—	66	21 Nov. 1897	12 Nov. 1898	*Village re-occupied on 14th December for 4 days on account of rain. Rats reported dying Bada (Kodae, Merau), 19th September 1898. No cases at Kodae and Merau.
			12 Nov. 1898	17 Nov. 1898	4	2	1	3*	—	10	1 Jan. 1899	—	
2	Bayeth - -	1,197	5 Jan. 1897	—	—	—	—	—	—	1	—	—	—
			17 Sept. 1897	17 Nov. 1897	39	11	6	1	4	61	8 Feb. 1898	—	—
3	Bharapur -	266	6 Sept. 1897	—	—	—	—	—	—	1	—	—	—
			27 Sept. 1898	30 Sept. 1898	1		2	—	—	4	16 Oct. 1898	—	—
4	Dhrub - -	416	8 Nov. 1897	12 Nov. 1897	1	7	12	—	—	20	7 Dec. 1897	—	—
5	Durgapur -	1,400	17 Jan. 1897	—	—	—	—	—	—	3	17 Jan. 1897	8 Nov. 1897	These cases are very doubtful; they were not reported till months after.
			8 Nov. 1897	9 Nov. 1897	2	3	1	1	1	8	24 Jan. 1898	—	
6	Gundiali -	4,280	10 Mar. 1897	—	—	—	—	—	—	210	1 Dec. 1897	28 May 1898	Turned out in September 1897, but date uncertain. About 30 cases after evacuation.
			28 May 1898	27 Aug. 1898	36	24	55	40	1	156	2 Nov. 1898	No cases between 18th October and 2nd November. 2 cases on latter date.	First partially evacuated on 27th August 1898. Then wholly about 25th September 1898. Found people visiting houses which were then sealed, and cases ceased.
7	Kathda - -	910	18 May 1897	—	—	—	—	—	—	27	—	—	Cannot give exact date of evacuation, but I remember there were only a very few cases after evacuation. Inquiries being made.
8	Khakhar Nani	572	4 Nov. 1897	4 Nov. 1897	4	2	3	2	—	11	15 Dec. 1897	—	—
9	Kodae - -	3,011	8 April 1897	2 Sept. 1897	11	4	3	1	—	19	9 Jan. 1898	—	3 cases and 3 deaths on 9th January 1898. None in November, December. Rats reported dying on 19th September 1898. No recrudescence.
10	Mandvi Town -	38,155	3 April 1897	—	—	—	—	—	—	4,224	13 Aug. 1897	10 Mar. 1898	Not evacuated in 1897, but many people ran away.
			10 Mar. 1898	—	—	—	—	—	—	748	21 Jan. 1899	—	At the beginning of epidemic of 1898 blocks of houses were first evacuated, and people persuaded to live in gardens. Disease very much checked till May. Then commenced turning people out until about 6,000, chiefly Muhammadans, remained. Plague then attacked these, and some 1,200 got out. Town never wholly evacuated.
11	Mahapur - -	242	4 Sept. 1897	—	—	—	—	—	—	36	16 Oct. 1897	—	Exact date of evacuation not noted, but was turned out after some 15 or 20 cases had occurred.
12	Merau - -	1,318	24 May 1897	28 Sept. 1897	75	6	1	2	—	84	15 Nov. 1997	—	Rats reported dying on 19th September 1898. No recrudescence.
13	Muska - -	2,000	9 Mar. 1897	—	—	—	—	—	—	140	16 Sept. 1897	18 June 1898	Turned out beginning of September 1897. About 20 cases after evacuation.
			18 June 1898	27 Aug. 1898	14	1	27	57	2	101	31 Oct. 1898	—	*See* remarks on Gundiali, No. 6. Dead rats found.
14	Nagalpur - -	1,058	28 Aug. 1897	15 Sept. 1897	10	4	8	4	2	28	17 Nov. 1897	29 May 1898	—
			29 May 1898	—	—	—	—	—	—	2	30 May 1898	—	
15	Ran - -	1,069	11 Oct. 1897	—	—	—	—	—	—	29	15 Dec. 1897	—	Evacuated after a few cases. Date not noted.
16	Sukhpur -	79	13 Nov. 1897	13 Nov. 1897	1	—	—	—	2	3	24 Jan. 1898	—	The last 2 cases on 24th January 1898.
17	Tanwana -	1,085	18 April 1897	—	—	—	—	—	—	5	26 April 1897	4 Nov. 1897	—
			4 Nov. 1897	5 Nov. 1897	1	2	3	7	5	18	2 Feb. 1898	—	—
18	Undote - -	913	24 Dec. 1898	7 Jan. 1899	5	4	—	—	—	9	26 Jan. 1899	—	—

No.	Name of Village.	Population, 1891 Census.	Date of First Plague Case.	Date of Evacuation.	No. of Plague Deaths: Before Evacuation.	Within 10 days after Evacuation.	During Remainder of First Month.	During Second Month after Evacuation.	During the Third Month.	Total.	Date of last Case of Plague.	Date of subsequent Recrudescence, if any	—
					MUNDRA TALUKA.								
19	Barai	1,159	27 Sept. 1897	24 Oct. 1897	12	12	10	3	1	38	8 Jan. 1898	—	—
20	Beraja	1,752	6 Nov. 1897	28 Dec. 1897	19	17	34	15	2	87	19 Mar. 1898	—	The Jadejas were allowed to remain in when the rest turned out. After a month or so, Jadejas attacked and turned out. 12th February 1898. After which date, 11 deaths. 1st case amongst Jadejas, wife of Tilat (Chief).
21	Bhorala	613	20 Jan. 1898	21 Jan. 1898		—	10*	2	—	13	24 Feb. 1898	—	*Probably due to clothes or visiting village.
22	Bhujpur	3,511	10 Oct. 1897	—	—	1	—	—	—	1	16 Oct. 1897	31 July 1898	—
			31 July 1898	27 Aug. 1898	20	8	12	7	—	47	14 Oct. 1898	—	Houses sealed up; wholly evacuated from the first.
23	Chasra	789	26 Feb. 1898	27 Feb. 1898	3	1	6	1	—	11	29 Mar. 1898	—	—
24	Gundala	1,498	4 Dec. 1897	29 Dec. 1897	4	28	16	3	1	52	28 Mar. 1898	—	Number of deaths after evacuation probably due to people visiting houses. Sealing of houses not carried out in 1897.
25	Gursama	477	2 Nov. 1897	7 Nov. 1897	3	1	4	1	—	9	8 Dec. 1897	—	—
26	Kapaya	1,260	3 Jan. 1897	—	—	—	—	—	—	4	16 Jan. 1897	29 Oct. 1897	—
			29 Oct. 1897	2 Nov. 1897	1	20	19	16	3	59	18 Jan. 1898	—	*See* Gundala, No. 24. Sealing houses commenced end of September 1898. with Gundiali, Muska, Bhujpur Salaya.
27	Khakher Mote	872	26 Jan. 1898	28 Jan. 1898	7	5	9	8	1	30	28 Mar. 1898	—	*See* Beraja, No. 20.
28	Luni	1,068	18 Sept. 1897	16 Dec. 1897	4	9	22	13	—	48	15 Feb. 1898	—	*See* Beraja. 2 cases in September. None in October and November.
29	Mundra Town	10,433	17 April 1897	11 Nov. 1897	344	8	13	2	—	367	13 Dec. 1897	—	Not wholly evacuated. See remarks, Mandvi, No. 10.
30	Mungra	169	5 Dec. 1897	5 Dec. 1897	—	—	—	—	—	—	28 Dec. 1897	—	Only 4 cases: no deaths.
31	Patri	1,535	11 Dec. 1897	11 Jan. 1898	5	10	13	3	2	33	16 Mar. 1898	—	*See* Beraja. No. 20
32	Pragpur	355	14 Dec. 1897	15 Dec. 1897	1	10	7	1	—	19	24 Jan. 1898	—	—
33	Sadau	753	5 Oct. 1897	4 Nov. 1897	57	9	6	1	—	73	6 Dec. 1897	—	—
34	Toda	350	17 Sept. 1897	5 Nov. 1897	23	10	20	2	—	55	11 Dec. 1897	—	—
35	Tumbdi	873	17 Sept. 1897	—	—	—	—	—	—	2	23 Oct. 1897	24 Oct. 1898	—
			24 Oct. 1898	1 Nov. 1898	3	—	—	—	—	3	24 Oct. 1898	—	—
					BHUJ TALUKA.								
36	Daisra	—	15 Sept. 1897	—	—	—	—	—	—	52	8 Nov. 1897	—	Under Bhuj District. Evacuation late. Date not known. These villages were under Chief Medical Officer of the State.
37	Kaira	2,000	1 April 1897	—	—	—	—	—	—	26	30 May 1897	17 Aug. 1897	
			17 Aug. 1898	—	—	—	—	—	—	73	28 Oct. 1897	—	
					ADDASA TALUKA.								
38	Prajau	—	1 Oct. 1898	8 Oct. 1898	2	2	8	12		27	23 Dec. 1898	—	The Jadejas were not turned out with the rest, and when I went to Parjau, the 7th December last, there were cases occurring amongst the Jadejas, who turned out a day or two before my arrival. This return is made out in the form as asked for by the Indian Plague Commission.

E. E. HYDE-CATES, Major,
Political Officer, Cutch.

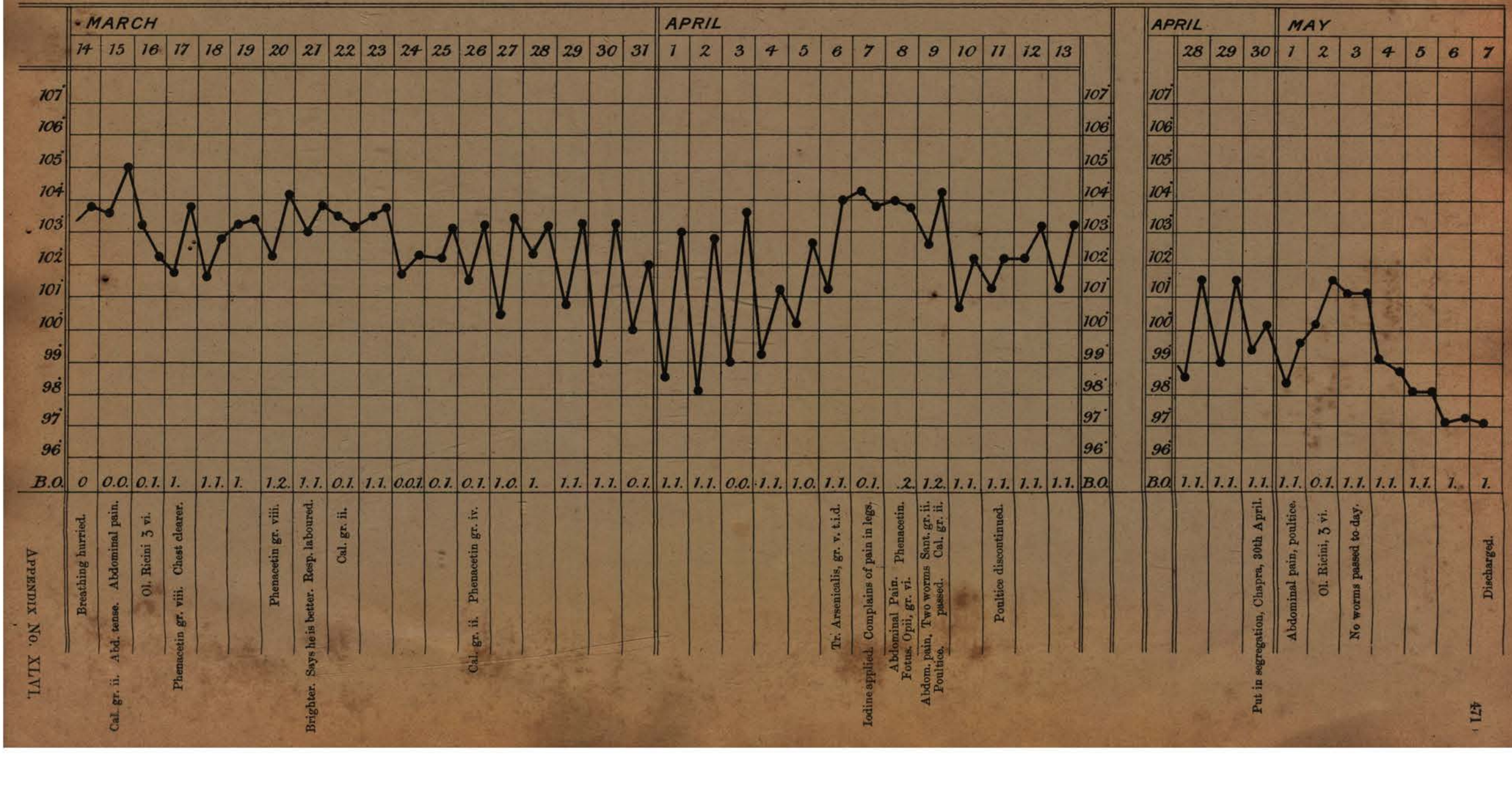
MANDVI.

KAVALADGUR KURAJI NARPATGUR, Age 13 years.

Caste:—Atit Bawa. From Mandvi City. Had plague last year.

Bubo:—Plague bacilli in sputum. *Days Ill*:—2. Admitted 14th March, 1898.

APPENDIX No. XLVI.
(See Question No. 13,492.)


MARCH
APRIL
APRIL
MAY
14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13
28 29 30 1 2 3 4 5 6 7
107 106 105 104 103 102 101 100 99 98 97 96
B.O. 0 0.0. 0.1. 1. 1.1. 1. 1.2. 1.1. 0.1. 1.1. 0.01. 0.1. 0.1. 1.0. 1. 1.1. 1.1. 0.1. 1.1. 1.1. 0.0. 1.1. 1.0. 1.1. 0.1. .2. 1.2. 1.1. 1.1. 1.1. 1.1. B.O.
B.O. 1.1. 1.1. 1.1. 1.1. 0.1. 1.1. 1.1. 1.1. 1. 1.
Breathing hurried.
Cal. gr. ii. Abd. tense. Abdominal pain.
Ol. Ricini 3 vi.
Phenacetin gr. viii. Chest clearer.
Phenacetin gr. viii.
Brighter. Says he is better. Resp. laboured.
Cal. gr. ii.
Cal. gr. ii. Phenacetin gr. iv.
Tr. Arsenicalis, gr. v. t.i.d.
Iodine applied. Complains of pain in legs.
Abdominal Pain. Phenacetin.
Fotus. Opii, gr. vi.
Abdom. pain, Two worms Sant. gr. ii.
Poultice, passed. Cal. gr. ii.
Poultice discontinued.
Put in segregation, Chaprs, 30th April.
Abdominal pain, poultice.
Ol. Ricini, 3 vi.
No worms passed to day.
Discharged.

APPENDIX No. XLVI.

APPENDIX No. XLVII.

(*See* Question No. 13,500.)

REPORT

ON

PLAGUE OPERATIONS IN CUTCH STATE

FROM

AUGUST 16TH, 1897, TO AUGUST 12TH, 1898,

BY

CAPTAIN H. DEMPSTER MASON, R.A.M.C.,

ON SPECIAL PLAGUE DUTY, CUTCH,

WITH

NOTES BY MAJOR HYDE-CATES, POLITICAL AGENT, CUTCH STATE.

Cutch Mandvi, 12th August, 1898.

(Not reprinted with the proceedings of the Commission.)

In continuation of the Report on Plague Operations in Cutch State from August 16th, 1897, to date, I propose, after a general *resumé* of the area infected, to deal with the various localities in the following under:—

1. Mandvi City.
2. Villages, Mandvi Taluka.
3. Mundra City.
4. Villages, Mundra Taluka.

The area of the infected district under my charge is approximately 400 square miles.

The whole of this district lies to the south of a line through Baet Ratadia, Tanwana, Bidra, Beraja, Patri, and Bhadresir; the infected part is by far the most populous, and the majority of the infected villages lie on the lines of communication between the large towns.

Out of a total of 52 villages 23 are situated on the sea-board between Mandvi and Anjar, a distance of 48 miles.

Mandvi City and Suburbs.

(*a.*) *Commencement of Recrudescence.*

From the 13th August 1897 to 28th December 1897, Mandvi City was totally free from plague. On the latter date an indigenous case occurred amongst the Meghwars living in a gaon of mud huts situated immediately outside the city wall and close to the Sonawalla gate. The whole population was immediately transferred into a temporary segregation camp, whilst the old gaol was destroyed and a new one erected on sanitary principles. Whilst in segregation camp three other cases developed (31st December). From the 31st December there was again a temporary cessation, until March 9th, 1898, when a case developed in the city itself (Kanji Shirji Salat, Falia Nuvapura). After this there has been a succession of cases up to date.

Not correct according to reports received from Dr. Mason at the time. He evidently wrote from memory. There were cases among Meghwals in January. —G.E.H.-C.

(*b.*) *Progress.*

Weekly report of cases and deaths appended.

Week Ending.	Mandvi. Cases.	Mandvi. Deaths.	Salaya. Cases.	Salaya. Deaths.	Remarks. (by Major Hyde-Cates.
1.	2.	3.	4.	5.	6.
11-3-98	2	2	—	—	Includes imported cases.
18-3-98	*15	13	—	—	* He has included under Mandv the cases in Mundra village and two imported cases. The cases in Mandvi were only six, and six deaths.
25-3-98	†11	7	—	—	
1-4-98	‡8	8	—	—	
8-4-98	2	5	—	—	
15-4-98	4	2	—	—	† Only one, and one in Mandvi.
22-4-98	4	4	—	—	
29-4-98	4	2	—	—	‡ 2 and 1 + 4 and 1 imported.
6-5-98	39	31	—	—	He has all through included Mundra villages with Mandvi City.
13-5-98	42	29	—	—	
20-5-98	64	30	—	—	
27-5-98	80	62	—	—	
3-6-98	56	43	—	—	
10-6-98	46	39	—	—	
17-6-98	49	44	9	4	
24-6-98	27	21	1	1	
1-7-98	18	16	—	—	
8-7-98	30	17	3	2	
15-7-98	32	28	6	5	
22-7-98	26	18	9	6	
29-7-98	21	19	8	7	
5-8-98	28	24	8	2	
12-8-98	13	14	9	7	
Total	621	478	53	34	

(c.) Cessation.

Had not ceased on 12-8-98.—G.E.H.-C.

The last case occurred on—

(d) Number of Cases and Deaths, including Salaya.

Cases.	Deaths.
4,692	4,135 in 1897.
674	512 in 1898.

(e.) Methods adopted for Indigenous Cases.

On account of the great probability of a recrudescence in the near future, the headmen of the various castes were called to this office in December 1897 to make the necessary arrangements for the evacuation of the city. It was decided that those who wished to leave the city before the recrudescence commenced would be allowed to go to the surrounding villages, but on the outbreak of plague no one would be (for fear of carrying the infection) permitted to enter the villages, but that arrangements would be made to accommodate them in the "waris" surrounding Mandvi city itself. The result of this conference was that a large proportion of the population left early in March and a much larger proportion for the "waris" after the first case of plague on March 9th. It is estimated that 5,000* only remained in the city out of a population of 40,000. To this fact alone I attribute the small number of cases and deaths during the present recrudescence.

* The end of May.—G.E.H.-C.

On account of the rains.—G.E.H.-C.

This remark is supported by the fact that from July 10th, the date when permission was given for the return of the population, to July 22nd, there was a marked increase in the number of cases and deaths, the cases rising from 18 to 30, 32, and 16, and the deaths from 16 to 17, 28, and 18 in the three following weeks, and this in spite of a considerable number who, after returning, found that plague still existed, and left promptly for their temporary homes again.

Yes.—G.E.H.-C.

Search Parties.

This undertaking proved a dead failure chiefly owing to the bribery and corruption, which appears to form an essential part of the local creed: 2nd. To the apathy of the natives employed: 3rd. To the want of encouragement in those who worked best.

Segregation of Contacts.

The arrangements under this head have varied from time to time with the exigencies of the disease. In the early stages inhabitants of whole blocks of buildings or small districts in which plague had occurred were segregated wholesale for 20 days. During the latter stages, owing to the general distaste for the rigour of the above measures and the fact that the wealthier classes preferred to conceal their cases and subject themselves to a heavy fine than exist for 20 days in a segregation camp, I adopted, with the consent of the Darbar the following scheme:—

This was only tried for 14 days before the date of the report.—G.E.H.-C.

(1.) No segregation for those who would be inoculated and have their clothes boiled before leaving the camp.
(2.) Infected houses to be closed no longer than necessary for disinfection, thorough cleaning and whitewashing.
(3.) No compulsory inoculation.
(4.) Those who object to inoculation to have their houses sealed, and do the usual period of segregation.

Corpse Inspection.

On the institution of this scheme, nobody was allowed to pass the city gates without certificates stating the disease and the cause of death. These certificates were given by a native doctor and an Hospital Assistant, and whilst admitting that by this means the first case in the recrudescence and a large number were subsequently discovered, in my opinion it possesses the disadvantage common to all schemes dependent for their success on the integrity of subordinate native officials, the facility with which the wealthy are enabled to avoid that to which the poor are condemned.

This must be the case, whether a measure is good or bad.—G.E.H.-C.

Every infected house has been whitewashed and cleansed. The disinfection process has varied, sulphurous acid, perchloride of mercury, phenyle, carbolic, &c., &c. Digging up of floors, followed by burning of straw, have in turns been tried.

The number of houses in which cases of plague have developed on re-occupation after disinfection this year is remarkably small, and is probably as much due to the length of time for which the houses are sealed as to the efficacy of the whitewash and disinfectants. Up to date only three have been re-infected.

Methods adopted for imported Cases.

All the ports of Cutch are closed to passengers except Mandvi and Khari Rohar.

The rules applying to the segregation of passengers arriving from Bombay, Karachi, and intermediate ports infected, were as follows:—

No steamer allowed to disembark between 6 p.m. and 6 a.m.

As steamers are unable to run alongside the quay, all passengers are brought to the Bandar in small native craft landed and conducted by a railed causeway to a medical examination enclosure, situated on the Bandar. From thence, those who are fit are passed by another railed causeway through the customs straight into the segregation camp, whilst those that are suspicious or sick where at once sent to the Observation Hospital. The segregation camp consists of four huge permanent Dharamsalas placed side by side, capable of holding 2,000 persons, admirably built of stone, and well-roofed. Each camp is built on the four sides of a square and entered through a large archway in one of the sides. The rooms are large, lofty, and well-lighted, and each is supplied with its own water-supply. In fact, there only remained to be added an external latrine system, and these buildings, furnished ready, made about as admirable a segregation camp as it is possible to imagine.

The guards to the Bandar and the camp were supplied by the 1st Grenadiers, the Cutch Police proving unequal to the duty.

On arrival at the camp the age, the caste, father's name, the place of departure, place of destination, is taken and registered. At uncertain times the register was called over in my presence to verify the number present in the camp.

The whole of the arrangements for food supply and cooking were carried out by the Headmen of the various castes, who were supplied with accommodation in the camp. The cooks resided on the premises, and Headmen interested in the conduct of these arrangements were allowed permanent passes.

No person was allowed to enter the camp without a temporary or permanent signed pass.

Disinfection of Clothing.

Where no special steam or dry air apparatus was procurable, it was necessary to utilize the materials at command. For this reason, large copper vessels were filled up over wood fires for the purpose of thoroughly boiling for fifteen minutes the personal clothing, and such of the bedding as permitted it, of the inmates of the camp. The remainder of the bedding, the contents of boxes and bags (the latter stalked in rows down the middle of the camps) were exposed to the sun daily with the exception of new silks which were only exposed for the first two mornings on account of the alleged injury produced.

The results of these methods proved excellent as no case of plague developed amongst those who were discharged from the camp, which could be attributed to deficiency of these measures.

The camp opened on October 7th, 1897, and closed 22nd July, 1898, during which time, 15,958 passed through, of which:—

178 were sent to the Observation Hospital,
22 to the Plague Hospital, of these,
19 died,
3 were discharged.

Curative.

From the outset of this recrudescence I considered it best to permit the various castes, Banniahs, Brahmans, Bhatias, Boras, Khojas, Lohanas, to conduct their own hospitals, subject to my daily supervision for the following reasons:—

1*stly.*—Because I consider it of the utmost importance in the conduct of plague measures to have not only the confidence of the people, but that the measures adopted should interfere as little as possible with caste prejudices, religious and otherwise, and with the general domestic arrangements of those most interested.

2*ndly.*—I am firmly convinced that the large number of cases concealed last year was due to the mixing of all castes except Muhammadans in one hospital, and that the cases concealed this year have been largely due to the severe restrictions placed on infected people.

3*rdly.*—That I believe the general remark that natives prefer to die in their houses than subject themselves willingly to any form of treatment by Europeans, to be incorrect, for experience has

shown that no one has greater fear of the disease than the native, and that no one is more ready to avail himself of assistance, provided that assistance be not made impossible.

4thly.—That the large majority of the expenses of the epidemic will be borne by the castes themselves for the future, thus relieving the Darbar.

(*See* App. No. VIII. in Vol. I. of the Proceedings of the Commission.)

The medical report up to August 16th, 1897, contained a detailed account of the epidemic from a clinical point of view. The recrudescence differed from the original:—

1. Chiefly in the fact that the inhabitants have been attacked largely by castes; commencing with the Salats in March, the disease attacked the Banniahs, Musalmans, and Bhatias in the order named.
2. In the far greater frequency of primary pneumonia, the chief factor in the enormous mortality in the earlier part of the epidemic.

The list already given above under the head (*b.*) *Progress*, illustrates the mortality.

It was found necessary to open a general hospital, conducted by the Darbar for the sick of the various castes not sufficiently numerous or wealtny to carry on hospitals of their own.

From a medical point of view the results prove this to have been no unwise measure, for by far the greatest number of recoveries occurred in the Musalman Hospital under native control, and not in the Darbar Hospital under European.

All Hindus, not Muhammadans. G.E H.-C.

In the native hospital all patients have been treated by their own doctors, with the exception of *those inoculated with serum antipesteux sent me by Dr. Roux, of the Pasteur Institute.

The number of cases inoculated, admitted, discharged, and died in the various hospitals are appended in the following list:—

No.	Names of Hospitals.	Total Admission.	Inoculated.	Discharged.	Died.	Percentage of Recovery.
1	General Hospital.	132	35	10	25	28·5
2	Banniah -	69	1	—	1	—
3	Bhatia -	54	6	—	6	—
4	Lohana -	74	8	5	3	62·5
5	Ridhgarji -	57	—	—	—	—
6	Muhammadan	98	18	9	9	50
7	Khoja -	12	—	—	—	—
8	Borah - -	22	—	—	—	—
9	Salaya -	29	—	—	—	—
10	Braham Khatri	2	—	—	—	—
	Total -	549	68	24	44	35·9

No.	Names of Hospitals.	Admitted.	Discharged.	Died.	Remaining.	Percentage of Recovery.
1	General Hospital.	132	34	93	5	25·7
2	Banniah -	69	18	51	—	26
3	Bhatia -	54	11	43	—	20·3
4	Lohana -	74	21	51	2	28·3
5	Ridhgarji -	57	10	41	6	17·5
6	Muhammadan	98	32	63	3	32·6
7	Khoji -	12	1	11	—	8·3
8	Borah -	22	5	17	—	22·7
9	Salaya -	29	1	20	6	3·4
10	Braham Khatri	2	—	2	—	—
	Total -	549	133	392	24	24·18
	Gundiali shed	1	—	1	—	—

1,044 persons of all ages have been inoculated with prophylactic serum, of which five cases have been attacked with plague after inoculation.

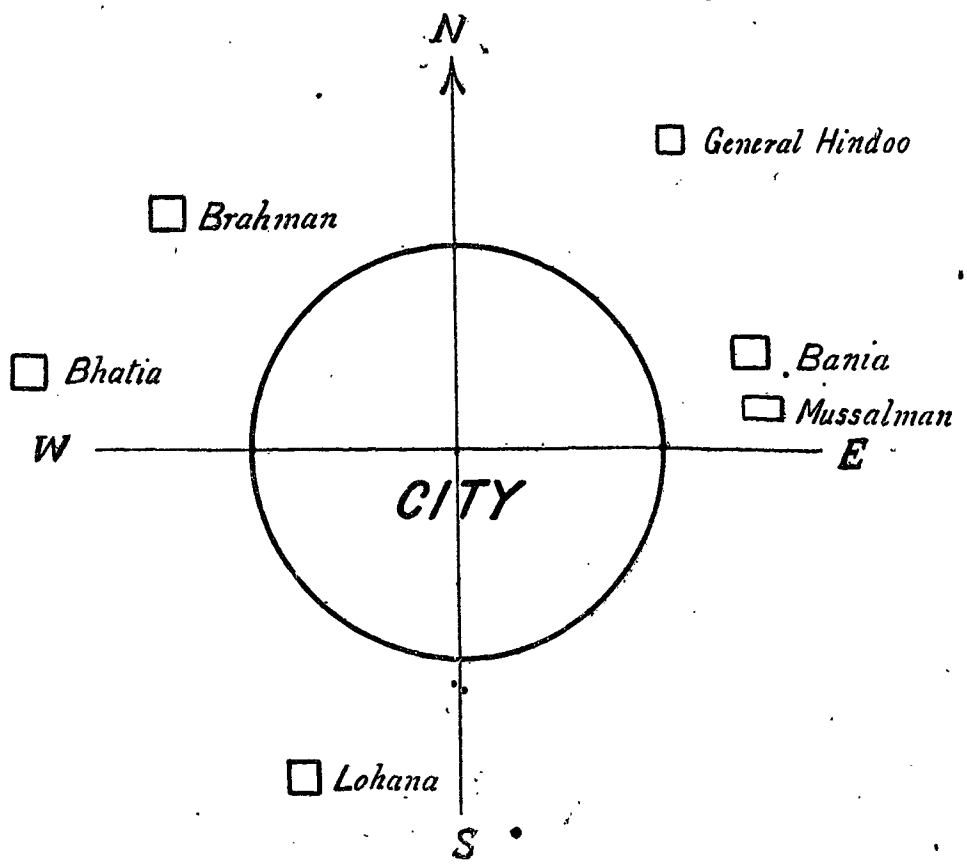
The following table illustrates the particulars of these five persons:—

No.	Names.	Age.	Residence.	Caste.	Date of Inoculation.	Date of Attack.	Result.
1	*Aisanbai -	8	Mundra	Borah	14-9-97	26- 9-97	Died on 28th.
2	*Karimji -	20	„	„	„	„	Died 1-10-97.
3	Esmalji -	—	„	„	„	25-10-97	Recovered.
4	Esaji - -	—	„	„	„	16-10-97	
5	Mahomedbhai	—	„	„	„	„	„

* These two cases were brother and sister; both were attacked 12 days after inoculation. Their mother was attacked with plague two days after the children were inoculated.

Preparation for the Rains.

In the early part of the season all the hospitals were built on the chappar principle in the hope that the disease would subside before the rains as it did last year; this hope was unfortunately not realised, consequently all the seven hospitals were transferred to permanent buildings, chiefly Dharamsalas, within a reasonable distance of the city.



The only exception is the general Hindu Darbar Hospital, which consists of an enormous square stone building 120 yards long, by 75 yards wide, roofed with galvanised iron sheets, and originally intended for the new engineer workshop. All these hospitals are perfectly weather proof, and the patients express themselves satisfied. Owing to the hardship experienced during the rains by the poorer classes, although the plague had not entirely disappeared from the city, it was considered absolutely necessary to give permission to return to those who had no proper shelter outside the town, whilst those who had house property outside were advised to remain there. Some of these refused to take this advice, returned, but on finding a certain number of cases occurring daily, left promptly.

(f.) Methods by which Inconvenience to Public may be minimised.

This question apparently resolves itself into the possibility, or otherwise, of abolishing segregation altogether—a measure implicating vast numbers of diverse peoples on which a local experience, however extended, can prove of but little value. Perhaps the nearest approach to the abolishing of segregation is the measure which has been in force here since July, permitting those residing in an infected house to come to the segregation camp, receive a preventive inoculation, have their clothes thoroughly disinfected, and be set at liberty the same day. The infected house is whitewashed, disinfected, and thoroughly cleansed, and sealed for four days, at the expiration of which the inmates are permitted to return. This measure has met with the success it deserves, for it not only reduces the inconvenience to the public to a minimum, but is, I submit, based on thoroughly sound medical principles.

For 14 days at date of writing only 55 inoculations.—G.E.H.-C.

I am greatly indebted to Dr. Simond and Dr. Roux of the Pasteur Institute for their kindness in supplying the necessary serum.

The number of people of both sexes and all ages who have preferred to be inoculated instead of being detained in segregation from July 24th to date is 55.

Amongst them no case of plague has developed.

(g.) Villages Mandvi Taluka.

The dates, commencement, duration, cessation, and the number of cases and deaths in each village, are given in the following table:—

TABLE OF VILLAGES.

No.	Names of Villages.	Date of Commencement.	Date of Cessation.	Duration in Days.	No. of Plague Cases.	No. of Plague Deaths.	Remarks. (by Major Hyde-Cates.)
1.	2.	3.	4.	5.	6.	7.	8.
†1	Mandvi City	*3- 4-97 9- 3-98	13- 8-97	133	4,045	3,596	* Date of recrudescence in 1898.
†2	Salaya	*24- 4-97 12- 6-98	29- 8-97	128	647	539	† In 1897 no separate returns for Salaya at all.
3	Gundiali	*13- 5-97 28- 5-98	25- 1-98	258	359	275	
4	Muska	*13- 5-97 4- 8-98	14-10-97	155	199	153	
5	Kodae	13- 7-97	21-12-97	162	262 *108*	128 *98*	Figures in *italics* put in from the Political Agent's records.
6	Godhra	2- 7-97	12- 1-98	195	229	160	
7	Merau	29- 4-97	15-10-97	170	256	146	
8	Durgapur	14-10-97	6-12-97	55	23	10	
9	Kathra	25- 5-97	11- 6-97	18	28	28	
10	Bhadia Nana	25- 7-97	12-1 -98	196	89	39	
11	Khakhar Nani	4-11-97	28-12-97	55	24	14	
12	Trigri	28- 9-97	25-10-97	28	7	3	
13	Rann	2-10-97	19-12-97	78	43	25	
14	Bada	6- 5-97	21-11-97	200	80	45	
15	Baet	12- 9-97	1- 2-98	143	54	48	
16	Ratadia	13-11-97	14-12-97	32	2	2	
17	Sukhpur	28-10-97	13-11-97	17	4	3	
18	Nagalpur	27- 8-97	17-11-97	83	42	37	
19	Tanwana	31-10-97	29-12-97	60	69	41	
20	Dhindh	22-11-97	26-12-97	35	3	3	
21	Rajpur	9- 1-98	11- 1-98	3	3	2	
22	Bharapur	31-10-97	6-11-97	7	2	2	
23	Bambhdai	9- 9-97	9-9 -97	1	1	1	
24	Mapur	8- 9-97	16-11-97	70	48	22	
25	Bidra	20-11-97	17-12-97	29	10	6	

(h.) Methods adopted.

The methods of dealing with plague in all infected villages are practically identical, so that a brief description of a typical instance will apply to the remainder.

On receipt of the news that a case had developed, or that rats were dying in any quantity, the head police officer, with a number of sowars, proportional to the size of the village, was forthwith despatched to evacuate the village and cause a segregation camp to be built on a suitable site, well away from the village. The camps were built in lines to form a square, the lines 50 feet apart, the huts in each line 20 feet apart.

Each hut erected by its future owner, proportionate to the size of the family, consisted of strong poles for stays, thatched and walled with straw. The doors all faced windward, and were numbered and ticketed with the name of the owner and the number of the family, with the object of facilitating the daily roll-call. Kitchens occupied the leeward side at a considerable distance, and, on account of the dangers of fire, no cooking was permitted in the huts.

The largest Dharamsala or permanent building provided a temporary hospital, usually with a Darbar Hospital Assistant in charge.

On account of the virulence of the disease, exceptions had to be made in favour of Gundialli, Kodae, and Merau, where a Darbar hospital was established, with nurses Jones, Hale, and Katsch in charge. The energy, enthusiasm, and self-sacrifice with which these ladies carried out their duties in desolate, isolated places, living in tents on the most meagre fare throughout the whole of the hot and rainy seasons, can only be fairly appreciated by those who actually saw it. The best compliment to their untiring efforts is the absolute confidence placed in them by the natives, male and female, who not only accepted everything in the hospital as a matter of course, but brought their relatives, and even their sick animals, from miles around.

The contrast in the duration of the epidemic in villages evacuated and those not evacuated will be gathered from the list appended, and is especially remarkable in those evacuated on the outbreak of the disease.

(i.) Mundra City.

Arrived at Mundra September 12th, 1897, and took over charge of operations from Surg.-Capt. Ricketts, I.M.S.

: The town had not been evacuated and plague was raging badly amongst the Khojas; after conference with Headmen the whole caste left the city. From this time the disease commenced to subside, and disappeared on 12th December 1897.

Precisely the same methods as to hospitals, treatment, segregation, &c., &c., as in Mandvi.

The number of cases admitted, discharged, and died is appended.

The assistance rendered by the Headmen of the various castes was much more cordial than in Mandvi, and was probably due to the influence of the Borah Mulla, who had gone through the epidemic in Mandvi.

Mundra and its Villages.

Plague of 1897.

No.	Names of Hospitals.	Admitted.	Discharged.	Died.
1	Mundra Hindu Hospital	304	99	205
2	„ Bhatia „	28	9	19
3	„ Khoja „	124	40	84
4	„ Borah „	13	4	9
5	„ M. Khatri Hospital.	24	5	19
6	Mundra Muhammadan Hospital.	49	15	34
7	Beraja Hospital -	114	29	85
8	Patri „ - -	27	2	25
9	Khakhar Moti Hospital	18	2	16
10	Chassra Hospital -	11	1	10
	Total - -	712	206	506

Recrudescence of 1898.

No.	Names of Hospitals.	Admitted.	Discharged.	Died.
1	Bhujpur shed - -	6	1	3
2	Tunda „ - -	1	—	—
	Total - -	7	1	3

(*j.*) *Mundra Villages.*

After the cessation of the disease in Mundra City, the crusade against plague in the villages commenced in earnest, and to my mind this part of the work was fraught with more difficulty and greater personal hardships to all concerned than all the rest of the work combined. With the epidemic confined to a walled city like Mandvi and Mundra with a large assistant staff, all went smoothly enough; but with small towns like Beraja 12 miles distant, Patri 10 miles, Khakhar 12 miles, all infected at the same time in the hottest season of the year, the amount of work entailed even on men in hard condition and accustomed to camels can easily be imagined. But I can never sufficiently express my gratitude to the English nurses for the splendid manner in which they faced cheerfully all these difficulties and after a short time accomplished their 24 miles on camels without a murmur. Our head-quarters were at Mundra Camp, and from there on alternate days, each nurse joined the cavalcade to one of the villages named. Their work in the villages consisted in the usual hospital duties, but they were absolutely indispensable amongst the Jadejas. This is a caste of the Hindus living in walled enclosures, apart from the inhabitants, obstinate to a degree, strongly averse to any interference, with a rigid pardah system, which permitted Europeans not even to enter their enclosures. It was here that the nurses were at their best; after a good deal more trouble than usual, this caste was persuaded to evacuate their fortresses, to arrange their own hospitals, attended solely by nurses, and live in temporary quarters until the disease subsided.

(*k.*) *Propagation of Disease in Villages.*

Both in Mandvi and Mundra Talukas, there are several points worthy of note in connexion with this subject:—

1. The preference shown for the sea-board villages; of these none but Mandvi, Navinal, Mundra and Anjar or Tuna Bandar are connected by sea.

2. For the villages connected by the commercial routes or by the best attempts to roads.

3. That in no village in which there has been no epidemic amongst the rats has plague spread amongst the people. In other words, I firmly believe that imported cases of plague do not cause epidemics, provided the rats be not infected.

In conclusion, after a continuous experience of 15 months, I have come to the conclusion that in dealing with plague there are two measures which are invaluable: 1 Evacuation; 2 Preventive inoculation with disinfection of clothes and houses in lieu of segregation. For the former it is only necessary to add the following list and to again quote the results of Mandvi City last year and this year.

It is also worthy of note as illustrating the sentiments of the people that many of them are building accommodation for themselves and their families in the country round to which they may resort in case of epidemics in the city.

(Signed) H. Dempster Mason,
Capt., R.A.M.C.

Mandvi,
August 14th, 1898.

Evacuated Villages.

No.	Villages.	Population.	Date of First Case.	Date of Last Case.	Duration of Epidemic in Days.	Date of Evacuation.	Date of Re-entrance.	Total Plague Cases.	Total Plague Deaths.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
								61	*45*
1	Bhanis Nana - -	1,077	25- 7-97	12- 1-98	196	24- 9-97	17-10-97	89	39
								33	*22*
2	Kodae - - -	3,011	13- 7-97	21-12-97	162	2- 9-97	18-11-97	262	128
								75	*66*
3	Bada - - -	—	6- 5-97	21-11-97	200	15-10-97	21-11-97	80	45
						17-11-97	—	*63*	*62*
4	Baet - - -	1,177	12- 9-97	1- 2-98	143	16- 9-97	16- 3-98	84	48
				15-11-97	—	—	—	*99*	*85*
5	Merau - - -	1,318	29- 4-97	15-10-97	170	28- 9-97	15-11-97	258	146
			4- 8-97	—	—	—	—	*30*	*29*
6	Ranu - - -	1,069	2-10-97	19-12-97	78	7-10-97	17- 1-98	43	25
				2- 2-98	—	—	—	*23*	*23*
7	Tanwana - -	1,085	31-10-97	29-12-97	60	5-11-97	28- 2-98	69	41
				30- 5-98	—	—	—	*30*	*30*
8	Nagalpur - -	1,058	27- 8-97	17-11-97	83	5- 9-97	24-10-97	42	37
			13-11-97	*24- 1-98*					
9	Sukhpur - -	89	28-10-97	13-11-97	17	8-11-97	28- 2-98	4	3
			8-11-97	*24- 1-98*	—	—	—	*14*	*13*
10	Durgapur - -	1,400	14-10-97	6-12-97	55	9-11-97	1- 1-98	23	10
			25-10-97	—	—	—	—	*1*	*1*
11	Trigri - - -	386	28- 9-97	25-10-97	28	28- 9-97	23-10-97	7	3
								504	*367*

Evacuated Villages—continued.

No.	Villages.	Popula-tion.	Date of First Case.	Date of Last Case.	Duration of Epidemic in Days.	Date of Evacuation.	Date of Re-entrance.	Total Plague Cases.	Total Plague Deaths.
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
12	Mundra - -	10,433	22- 8-97	12-12-97	112	11-11-97	29-12-97	446	337
								44	*37*
13	Barai - - -	1,159	26- 9-97	7- 1-98	104	24-10-97	30-12-97	55	40
						4-11-97	—	*77*	*73*
14	Sadau - - -	753	4-10-97	5-12-97	63	4-10-97	31-12-97	85	71
								79	*63*
15	Kopaya Mota - -	1,260	26-10-97	17- 1-98	83	2-11-97	25- 3-98	76	58
16	Mungra - - -	169	4-12-97	27-12-97	24	4-12-97	5- 3-98	4	—
17	Gursama - - -	477	31-10-97	7-12-97	39	7-11-97	30-12-97	13	10
								40	*33*
18	Patri - - -	1,804	10-12-97	15- 3-98	96	11- 1-98	13- 4-98	35	26
								125	*87*
19	Beraja - - -	1,622	5-11-97	18- 3-98	134	28-12-97	28- 4-98	123	85
								67	*52*
20	Gundala - -	1,498	8-12-97	27- 3-98*	81	29-12-97	11- 4-98	65	49
								34	*30*
21	Khakhar Moti - -	942	25- 1-98	22- 3-98	57	25- 1-98	2- 5-98	43	31
22	Dhrub - - -	416	7-11-97	5-12-97	60	12-11-97	4- 3-98	20	20
						21- 1-98	—	*18*	
23	Bhorala - - -	613	19- 1-98	21- 2-98	34	27-12-97	7- 4-98	15	13
								63	
24	Luni - - -	1,068	20- 9-97	15- 2-98	151	16-12-97	27- 2-98	55	48
				24- 1-98	—	—	—	*26*	*19*
25	Pragpur - - -	355	13-12-97	5- 1-98	24	15-12-97	24- 2-98	24	17
								61	*55*
26	Toda - - -	443	17- 9-97	9-12-97	84	5-11-97	17- 2-98	49	45
									11
27	Chhasra - - -	789	25- 2-98	24- 3-98	28	25- 2-98	16- 5-98	15	10

* *Note* by Major Hyde-Cates.—Actually ceased 38 days before.

(N.B.—Figures in *italics* filled in by the Political Agent from his records.)

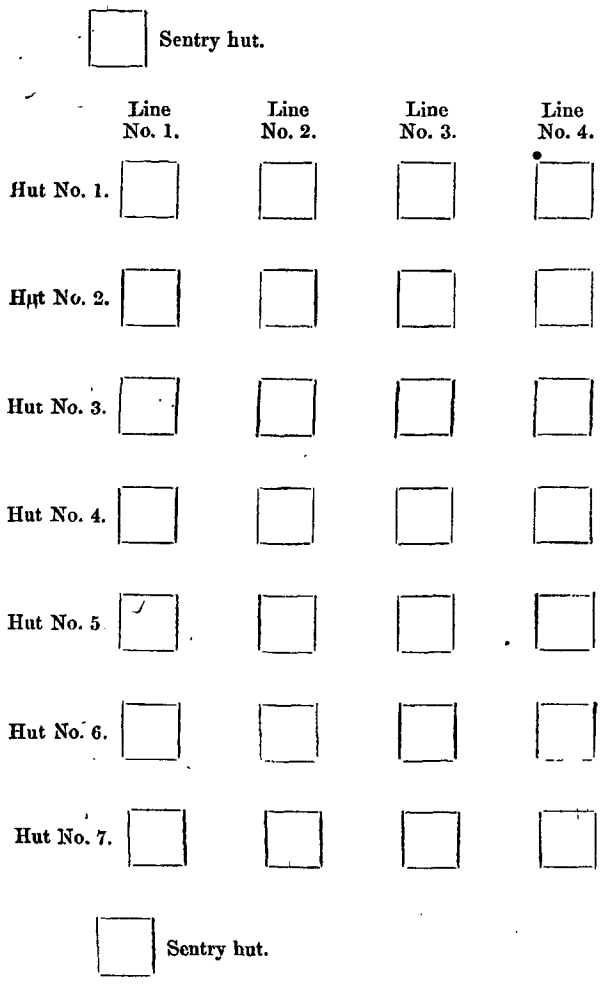
Non-evacuated Villages.

No.	Villages.	Population.	Date of First Case.	Date of Last Case.	Duration of Epidemic in Days.	No. of Total Plague Cases.	Total Plague Cases.	Remarks. (By Major Hyde-Cates.)
1.	2.	3.	4.	5.	6.	7.	8.	9.
1	Mandvi - - -	36,188	3- 4-97	13- 8-97	133	4,045	3,596	* Was turned out in 1898 not 1897. Figures for the two years should be much more.
2	Salaya - - -	6,446	24- 4-97	29- 8-97	128	647*	539*	
			3			*174*	*144*	
3	Muska - - -	2,002	13- 5-97	14-10-97	155	199	153	
			3			*254*	*225*	
4	Gundiali - - -	4,280	13- 5-97	25- 1-98	258	359	275	
						108	*98*	
5	Godhra - - -	1,992	2- 7-97	12- 1-98	195	229	160	
						11	*11*	
6	Khakhar Nani - -	572	4-11-97	28-12-97	55	24	14	
			26- 6-97	*6- 8-98*	—	*8*	*5*	
7	Bidra - - -	3,628	20-11-97	17-12-97	29	10	6	
8	Dhindh - - -	—	22-11-97	26-12-97	35	3	3	
9	Kathda - - -	—	25- 5-97	11- 6-97	18	28	28	
			6- 9-97	*16-10-98*	—	*5*	*5*	
10	Bharapur - - -	233	31-10-97	6-11-97	7	2	2	
				10	—	*36*	*36*	
11	Mapur - - -	—	8- 9-97	16-11-97	70	48	22	
				11				
12	Ratadia Mota - -	—	13-11-97	14-12-97	32	2	2	
13	Bambhdai - - -	—	9- 9-97	9- 9-97	1	1	1	
						1	*1*	
14	Rajpur - - -	208	9- 1-98	11- 1-98	3	3	2	
						1	*1*	
15	Vadala - - -	2,008	17-10-97	29-10-97	13	4	4	
16	Vanku - - -	961	14-10-97	14-10-97	1	1	1	
17	Kapaya Nana - -	196	1-10-97	1-10-97	1	1	1	
18	Kundradi - - -	621	6-10-97	6-10-97	1	1	1	
19	Tumbdi - - -	837	17- 9-97	21-10-97	5	3	3	
				11- 8-98	—	*11*	*5*	
20	Bhujpur - -	3,511	8-10-97	8- 1-98	93	5	2	
21	Jarparo - - -	1,633	31-10-97	31-10-97	1	1	1	
22	Desulpur - - -	1,739	18- 9-97	18- 9-97	1	1	1	
23	Lakhapur - - -	1,038	10-11-97	10-11-97	1	1	1	
			9	*9*				
24	Virani - - -	151	17- 8-97	17- 8-97	1	1	1	
				7-10-97	*41*	—	*4*	
25	Bhadresir - - -	2,362	13- 9-97	22- 9-97	10	4	2	

Mandvi and Saloya.

Epidemic of 1897.		Recrudescence of 1898 (City largely Evacuated).		Remarks.
Cases.	Deaths.	Cases.	Deaths.	
1.	2.	3.	4.	5
4,692	4,135	674	512	

Rough Sketch of a Segregation Camp in Villages.



SERIES of EXPERIMENTS on ANIMALS made with SERUM-ANTIPESTEUX HORSE No. 31.

I.

Mouse No. 1. — Inoculated with plague culture (pricked at root of tail), 5 minutes after received $\frac{1}{50}$ c.c. serum. *Died in* 3 *days.*

Mouse No. 2. — Inoculated with plague culture (pricked at root of tail), 5 minutes after received $\frac{1}{40}$ c.c. serum. *Recovered.*

Mouse No. 3. — Inoculated with plague culture (pricked at root of tail), 20 minutes after received $\frac{1}{10}$ c.c. serum. *Died in* 90 *hours.*

Mouse No. 4. — Inoculated with plague culture (pricked at root of tail), 20 hours after received $\frac{1}{8}$ c.c. serum. *Recovered.*

Mouse No. 5. — Inoculated with plague culture (pricked at root of tail), received no serum. *Died in* 42 *hours.*

II.

Mouse No. 1.—Inoculated with blood of a rat died of plague, 20 hours after received $\frac{1}{4}$ c.c. *Died in* 7 *days.* Neither examination of organs nor culture showed plague bacilli, but there was reason to believe death due to plague.

Mouse No. 2.—Inoculated with blood of a rat died of plague, received no serum. *Died in* 60 *hours.*

III.

Mouse No. 1.—Inoculated with lymph from a human plague pustule containing enormous numbers of bacilli, 24 hours afterwards received $\frac{1}{4}$ c.c. *Recovered.*

Mouse No. 2.—Inoculated with same lymph, received no serum. *Died in* 76 *hours.*

SERIES of EXPERIMENTS made with No. 88.

I.

Mouse No. 1.—Inoculated with culture from human bubo, 20 hours after received $\frac{1}{4}$ c.c. *Recovered.*

Mouse No. 2.—Inoculated with culture from human bubo, received no serum. *Died in* 72 *hours.*

II.

Rat No. 1.—Inoculated by injection with $\frac{1}{20}$ c.c. of the blood from the heart of a mouse dead of plague, 24 hours after received 2 c.c. serum. *Recovered.*

Rat No. 2.—Inoculated by injection with $\frac{1}{20}$ c.c. of the blood from the heart of a mouse dead of plague, received 36 hours after 2 c.c. serum. *Died in* 96 *hours.*

Rat No. 3.—Inoculated by subcutaneous injection with $\frac{1}{20}$ c.c. of the blood from the heart of a mouse dead of plague, received no serum. *Died in* 71 *hours.*

III.

Monkey No. 1.—Received by subcutaneous inoculation the half of a mixture made by crushing up in 2 c.c. of sterile matter, the spleen, the heart, and the liver of a mouse which had died of very virulent plague, into the right thigh; after 12 hours an enormous femoral bubo appeared; after 18 hours completely knocked over, high fever, walked with difficulty, refused food; after 24 hours received 20 c.c. subcutaneous; after 49 hours not much change, difficulty in walking increased. Second injection of 20 c.c. serum after 66 hours. General improvement on fourth day, began to eat again, bubo increased in size, and commencing to break down; *complete recovery on* 10*th day.*

The monkeys were baboons (*Cynocephalus Babuin*). G.E.H.-C.

Monkey No. 2. — Received same quantity of same preparation at same time (other half); after 12 hours, bubo in the right thigh (place of infection); after 24 hours, fever; less knocked up than 1; after 36 hours, dejection and difficulty of walking increased; after 48 hours, could scarcely move; after 60 hours, *died.*

(Signed) H. D. MASON,
Capt. R.A.M.C.

MEMORANDUM on Dr. MASON'S REPORT.

It is necessary to remark on the inaccuracies in this report, otherwise the Plague Commissioners will find it difficult to understand my evidence.

2. The figures of cases and deaths against the Mandvi villages are totally incorrect. During the epidemic of 1897, at Mandvi, the villages had for a time to shift for themselves, by which I mean that none of the Staff at Mandvi could be spared to look after them, and they were left to State village officials. The returns at that time were no doubt unreliable, and Dr. Mason, considering that there were many more cases than reported, has assumed an arbitrary figure of his own, but there is no reason to suppose that the plague raged to the

extent he has assumed. Take, for instance, the case of Merau (infected once), with a population of 1,318. The known figures are 99 cases, and 85 deaths. Dr. Mason has put it (*vide* list of evacuated villages in his report) at 258 cases, and 146 deaths. Now Gundiali, which has a population of 4,280, was more severely affected by far than any other village, yet, in his list of non-evacuated villages, he gives the figures for Gundiali at 359 cases, and 275 deaths. These figures include 17 cases and 17 deaths for 1898. The Mundra villages were not attacked till towards the end of 1897, when plague had practically ceased in the Mandvi District, and Dr. Mason and the staff were able to attend to those villages. The returns since then have been reliable, and his figures tally on the whole with those in this office sent by the Darbar, and yet Beraja, the most severely infected village in that district, with a population of 1,752, and infected for the first time, had only 126 cases and 87 deaths. The same may be said of his other figures against the Mandvi villages.

3. Under Mandvi city (under the heading (*b.*) *Progress* in his report) he has included cases occurring in the *Mundra villages!*

4. Kathda has been shown as a non-evacuated village, which is incorrect, Dr. Wilkins went there to evacuate it, and I went with him to the village a few days afterwards. Gundiali is shown as not evacuated. It was practically not evacuated till the plague ceased in 1897, as I have stated in my evidence. It was evacuated in 1898, after the date of Dr. Mason's report. The date of evacuation of Bhorala is given as the 27th December 1897, while the first case occurred on the 19th January 1898, which is the correct date according to the returns.

5. Dr. Mason, under the heading (*f*) his report, mentions the success of the measure attending the inoculation of contacts, and allowing them to go back to their houses after the same had been disinfected. The measure had only been in existence a fortnight when he wrote, and only 55 persons were inoculated. I have nothing to say against inoculation, and the more healthy people inoculated the better, since it seems a success with Haffkine's fluid, but I have grave doubts about the expediency of opening up infected houses so soon. The inoculated may be safe, but there is danger to others. As a matter of fact I found persons who had not been inoculated in two or three houses within a few days of their becoming infected. Though the disinfection may be sufficient, I think it is safer to keep the house shut up for as long as possible, with, of course, the tiles removed. I think that this helps to destroy the infection.

With regard to the 1,044 inoculations, only five attacks after inoculation came to notice; but unless a strict record was kept, and some watch on the persons inoculated, it is quite possible there may have been more cases than reported. They may have gone into the caste hospitals presided over by their own people (with a general supervision by Dr. Mason), and no questions asked. Yersin himself only claimed that the serum gave immunity for 21 days at the most, and perhaps not more than 14.

Under the heading (*k*) of his report, Dr. Mason says that there can be no epidemic unless there is an epidemic amongst the rats. Rats undoubtedly spread the disease, but I do not know that he is right to say conclusively that there can be no epidemic without the rats. Rats have undoubtedly been found in Mandvi, and some of the villages, but I can find no one who can say that he has seen them die in such large numbers. Dr. Mason has never reported what might be called an epidemic amongst the rats. I am inclined to think that the disease is peculiar to human beings, and rats, being susceptible to it, contract the disease and help to spread it; but I believe, putting aside the rats, that there can be an epidemic, especially in such villages as Bada and Undote, where the people are of the same caste, and more or less related; that is to say, if they were left alone, and no measures for segregation, evacuation, &c. were taken. The cases at Rawapur and Muska were certainly not due to rats.

G. E. HYDE-CATES, Major,
Political Agent, Cutch.

Bhuj, February 15th, 1899.

APPENDIX No. XLVIII.

(*See* Question No. 13,561.)

STATEMENT

SHOWING THE VILLAGES INFECTED SINCE THE COMMENCEMENT OF PLAGUE, IN THE PROVINCE OF CUTCH (1897 to the beginning of 1899).

Name of Taluka.	Serial No.	Name of Village.	Population, 1891 Census.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.	Total No. of Plague Deaths.			Remarks.
							Before Evacuation.	Subsequent to Evacuation.	Total.	
Mandvi	1	Bada	1,400	11-5-97	21-11-97	15-12-97	63	3	66	
				12-11-98	1-1-99	17-11-98	4	6	10	
	2	Bayeth	1,197	5-1-97	5-1-97	—	1	—	1	Probably imported.
				17-9-97	8-2-98	17-11-97	39	22	61	
	3	Bambdai	764	9-9-97	9-9-97	—	1	—	1	
		Bharapur	266	6-9-97	6-9-97	—	1	—	1	
				27-9-98	16-10-98	30-9-98	1	3	4	
	5	Bhadia Nana	1,077	20-6-97	24-9-97	24-9-97	43	—	43	Date of last case. (Two cases on 12-1-98.)
	6	Bhojae	—	17-4-97	17-4-97	—	1	—	1	
	7	Bidra	3,368	26-6-97	28-9-97	—	3	—	3	
				8-6-98	8-6-98	—	1	—	1	
	8	Dhindh	327	22-11-97	18-12-97	—	2	—	2	
	9	Dhrub	416	8-11-97	7-12-97	12-11-97	1	19	20	
	10	Durgapur	1,400	17-1-97	17-1-97	—	3	—	3	
				8-11-97	24-1-98	9-11-97	2	6	8	
	11	Ghudsisa	—	18-4-97	18-4-97	—	3	—	3	
	12	Godra	1,992	4-7-97	2-1-98	—	98	—	98	
	13	Gundiali	4,280	10-3-97	1-12-97	—	210	—	210	Turned out September 1897. Date uncertain. About 30 cases after evacuation.
				28-5-97	2-11-98	27-8-98	36	119	155	1898, August 27th, first partially evacuated, then wholly about 15-9-98. Found people visiting houses which were then sealed, and cases ceased.
	14	Kathda	910	18-5-97	13-6-97	—	27	—	27	This village was evacuated about end of May. Date uncertain. But there were only a few cases after evacuation. Reported in Annual Report for 1897.
	15	Khakar Nani	572	4-11-97	15-12-97	—	11	—	11	Evacuated same day as first case.
	16	Kodae	3,011	8-4-97	9-1-98	2-9-97	11	11	22	19 deaths to October 3rd, 1897; then 3 deaths on January 1898.
	17	Lakhapur	1,038	11-11-97	11-11-97	—	1	—	1	
	18	Ludwa	705	3-4-97	8-4-97	—	2	—	2	
	19	Mandvi (Town)	38,155	3-4-97	13-8-97	—	—	—	4,224	Not evacuated in 1897, but many people ran away. At the beginning of the epidemic of 1898 blocks of houses were first evacuated, and people persuaded to live in wadis. Disease very much checked till May. Then commenced turning people out until about 6,000, chiefly Muhammadans, remained. Plague then attacked these, and some 1,200 got out. Town never wholly evacuated.
				10-3-98	21-1-99	—	—	—	748	
	20	Mahapur	242	4-9-97	16-10-97	—	36	—	36	Exact date of evacuation not noted, but was turned out after some 15 or 20 cases had occurred.
	21	Merau	1,318	24-5-97	15-11-97	28-9-97	75	9	84	
	22	Muska	2,000	9-3-97	16-9-97	—	140	—	140	Turned out beginning September 1897. About 20 cases after evacuation. *See* remark on Gundiali, No. 13.
				18-6-98	31-10-98	27-8-98	14	86	100	
	23	Nagalpur	1,058	28-8-97	17-11-97	15-9-97	10	18	28	
				29-5-98	30-5-98	—	2	—	2	In the wadis (gardens).
	24	Navo Was	—	6-12-97	6-12-97	—	1	—	1	
	25	Ran	1,069	11-10-97	15-12-97	—	29	—	29	Evacuated after a few cases. Date not noted.
	26	Rajpur	208	12-1-98	12-1-98	—	1	—	1	
	27	Sarli	—	28-11-97	6-12-97	—	2	—	2	
	28	Shirwa	607	14-5-98	14-5-98	—	1	—	1	
	29	Sukhpur	79	13-11-97	24-1-98	—	—	3	3	Was turned out on first case.
	30	Tanwana	1,085	18-4-97	26-4-97	—	5	—	5	
				4-11-97	2-2-98	5-11-97	1	17	18	
	31	Trigri	386	25-10-97	25-10-97	—	1	—	1	
	32	Undote	913	24-12-98	26-1-99	7-1-99	5	4*	9	* Up to 18-1-99.

Name of Taluka.	Serial No.	Name of Village.	Population, 1891 Census.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.	Total No. of Plague Deaths. Before Evacuation.	Subsequent to Evacuation.	Total	Remarks.
Mundra	33	Barai	1,159	27-9-97	8-1-98	24-10-97	12	26	38	
	34	Beraja	1,752	6-11-97	19-3-98	28-12-97	19	68	87	The Jadejas were allowed to remain in when the rest turned out. After a month or so Jadejas attacked, and turned out 12-2-98, after which date 11 deaths.
	35	Bhorala	613	20-1-98	24-2-98	21-1-98	1	12	13	Turned out on first cases appearing. Date not noted.
	36	Bhadresir	2,362	13-9-97	7-10-97	—	4	—	4	
	37	Bhujpur	3,511	10-10-97	16-10-97	—	1	—	1	
				31-7-98	14-10-98	27-8-98	20	27	47	
	38	Chasra	789	26-2-98	29-3-98	27-2-98	3	8	11	
	39	Desulpur	1,739	19-9-97	19-9-97	—	1	—	1	
	40	Gundala	1,498	4-12-97	28-3-98	29-12-97	4	48	52	Number of deaths after evacuation probably due to people visiting houses. Sealing of houses not carried out in 1897.
	41	Gursama	477	2-11-97	8-12-97	7-11-97	3	6	9	
	42	Kapaya	1,260	3-1-97	16-1-97	—	4	—	4	
				29-10-97	18-1-98	2-11-97	1	58*	59	* *See* Gundala, No. 40. Sealing houses commenced September 1898, with Gundala, Muska, Bhujpur, Salaya.
	43	Khakhar Moti	872	26-1-98	28-3-98	28-1-98	7	23	30	*See* Beraja, No. 34.
	44	Kundradi	621	7-10-97	7-10-97	—	1	—	1	
	45	Luni	1,068	18-9-97	15-2-98	16-12-97	4	44	48	*See* Beraja, No. 34. Two cases in September, none in October and November.
	46	Mundra Town	10,433	17-4-97	13-12-97	11-11-97	344	23	367	Not wholly evacuated. *See* remarks, Mandvi, No. 19.
	47	Mungra	169	5-12-97	28-12-97	5-12-97	—	—	—	Only four cases; no deaths.
	48	Patri	1,535	11-12-97	16-3-98	11-1-98	5	28	33	*See* Beraja, No. 34.
	49	Pragpur	355	14-12-97	24-1-98	15-12-97	1	18	19	
	50	Ratadia Mota	671	13-11-97	13-11-97	—	2	—	2	
	51	Sadan	753	5-10-97	6-12-97	4-11-97	57	16	73	
	52	Toda	350	17-9-97	11-12-97	5-11-97	23	32	55	
	53	Tumbdi	873	17-9-27	23-10-97	—	2	—	2	
				24-10-98	24-10-98	1-11-98	3	—	3	
	54	Vadala	2,008	29-10-97	29-10-97	—	1	—	1	
	55	Virani	227	17-9-97	17-9-97	—	1	—	1	
Bhuj	56	Daisra	—	15-9-97	8-11-97	—	—	—	52	Under Bhuj District. Evacuated late. Date not known.
	57	Kera	2,000	1-4-97	30-5-97	—	—	—	26	These villages were under Chief Medical Officer of the State.
				17-8-97	28-10-97	—	—	—	73	
Nakhtrana	58	Rawapur	—	13-2-97	4-3-97	—	14	—	14	
	59	Desulpur	—	16-2-97	16-2-97	—	1	—	1	
Abdasa	60	Nalia	5,265	21-5-97	21-5-97	—	1	—	1	
	61	Kothara	3,410	16-4-97	16-4-97	—	1	—	1	
	62	Prajan	655	1-10-98	23-12-98	8-10-98	2	25	27	

N.B.—(1.) Where the column "Date of Evacuation" is not filled in, the villages were not evacuated.
(2.) Most of the villages, being small, were evacuated in one day, or two or three at most, hence column of "Deaths during Evacuation" not filled in. Only dates of complete evacuation noted.

G. E. HYDE-CATES, **Major,**
Political Agent, Cutch.

APPENDIX No. XLIX.

(*See* Question No. 13,720.)

STATISTICS REGARDING THE EPIDEMIC OF PLAGUE

IN

PORBANDOR, 1898.

A.

STATEMENT showing the WEEKLY TOTAL MORTALITY from January to November 1898, in the Town of PORBANDOR.

January	-	First week	- 18	
,,	-	Second ,,	- 7	
,,	-	Third ,,	- 14	
,,	-	Fourth ,,	- 14	
				53
February	-	First week	- 17	
,,	-	Second ,,	- 11	
,,	-	Third ,,	- 8	
,,	-	Fourth ,,	- 12	
				48
March	-	First week	- 17	
,,	-	Second ,,	- 16	
,,	-	Third ,,	- 21	
,,	-	Fourth ,,	- 20	
				74
April	-	First week	- 11	
,,	-	Second ,,	- 19	
,,	-	Third ,,	- 13	
,,	-	Fourth ,,	- 10	
				53
May	-	First week	- 14	
,,	-	Second ,,	- 28	
,,	-	Third ,,	- 42	
,,	-	Fourth ,,	- 46	
				130
June	-	First week	- 20	
,,	-	Second ,,	- 34	
,,	-	Third ,,	- 69	
,,	-	Fourth ,,	- 79	
				202
July	-	First week	- 53	
,,	-	Second ,,	- 47	
,,	-	Third ,,	- 56	
,,	-	Fourth ,,	- 54	
				210
August	-	First week	- 66	
,,	-	Second ,,	- 106	
,,	-	Third ,,	- 91	
,,	-	Fourth ,,	- 82	
				345
September	-	First week	- 36	
,,	-	Second ,,	- 36	
,,	-	Third ,,	- 35	
,,	-	Fourth ,,	- 28	
				135
October	-	First week	- 26	
,,	-	Second ,,	- 23	
,,	-	Third ,,	- 19	
,,	-	Fourth ,,	- 13	
				81
November	-	First week	- 17	
,,	-	Second ,,	- 9	
,,	-	Third ,,	- 10	
,,	-	Fourth ,,	- 12	
				48
		Grand Total	- 1,379	

TOTAL ATTACKS and DEATHS due to PLAGUE in the TOWN of PORBANDOR in the EPIDEMIC of 1898.

Date.	May.		June.		July.		August.		September.		October.		November.	
	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.	Attacks.	Deaths.
1	—	—	0	0	5	2	3	5	4	3	0	1	1	0
2	—	—	0	1	1	0	1	2	5	2	1	0	0	0
3	—	—	0	0	2	4	3	0	2	2	2		0	0
4	—	—	0	0	3	3	5	3	0	2	4	2	0	0
5	—	—	0	0	2	1	4	4	4	4	3	1	0	0
6	—	—	0	0	1	1	4	1	2	2	1	1	2	1
7	—	—	2	0	1	1	3	2	1	1	0	1	1	0
8	—	—	0	1	1	1	4	2	1	1	1	0	0	0
9	—	—	1	0	0	1	5	4	1	0	1	2	0	0
10	—	—	0	1	0	0	5	5	4	2	4	0	0	1
11	—	—	0	0	1	1	5	6	2	1	4	2	0	0
12	—	—	0	0	1	1	6	4	3	1	1	2	0	0
13	—	—	1	0	0	0	7	8	4	3	0	1	0	0
14	—	—	0	0	0	0	8	9	2	3	0	1	0	0
15	—	—	1	0	0	0	5	5	1	2	2	0	—	—
16	—	—	4	0	3	2	7	7	4	3	1	0	—	—
17	—	—	6	1	2	2	6	3	2	3	1	0	—	—
18	2	0	6	1	1	0	6	3	2	1	2	1	—	—
19	2	1	9	5	3	3	6	8	3	3	1	3	—	—
20	3	2	9	5	2	3	6	6	3	1	1	2	—	—
21	5	2	6	8	1	0	6	6	2	1	1	1	—	—
22	4	1	6	5	1	0	5	4	1	0	0	0	—	—
23	8	7	5	6	2	0	5	5	0	2	1	2	—	—
24	4	7	4	3	2	3	11	7	2	2	0	0	—	—
25	4	2	3	0	2	1	5	6	1	1	0	0	—	—
26	3	3	11	5	2	1	8	7	3	2	0	1	—	—
27	2	1	4	3	3	0	5	6	3	1	0	0	—	—
28	0	0	5	2	1	2	5	3	3	1	1	1	—	—
29	0	0	4	4	2	4	10	6	1	2	0	0	—	—
30	1	0	3	8	3	3	10	7	1	2	0	0	—	—
31	0	1	—	—	3	1	7	3	—	—	0	0	—	—

C.

STATEMENT showing the Number of PLAGUE ATTACKS and DEATHS during the PERIOD commencing with the 17th of May and ending with the 8th of June in the Town of PORBANDOR:—

	Attacks.	Deaths.
Kharwas (Hindu)	35	24
Luvanas (Hindu)	3	1
Bhois (Hindu)	1	—
Luvanas (Hindu)	1	—
Kubavalias (Mussalman)	4	4
Borahs (Shia Mussalman)	1	1
Parsees	2	1
Total	47	31

D.

TABLE showing the ATTACKS and DEATHS according to OCCUPATION and CASTES.

Occupation.	Attacks.	Deaths.	Cured.
Boatmen and Sailors, including Fishermen.	40	24	16
Labourers	80	58	22
Corn Dealers and Grocers	20	13	7
Cloth Sellers	2	2	—
Shoaffs and Bankers	2	2	—
Salt Sellers	3	1	2
Vegetable Sellers and Greengrocers.	6	4	2
Weavers	4	3	1
Peons and Domestic Servants	19	14	5
Public Servants	5	2	3
Petty Shopkeepers	9	8	1
Butchers	11	9	2
Beggars	39	30	9
Potters	13	8	5
Goldsmiths	3	3	—
Artizans	11	11	—
Lukars	1	—	1
Barbers	1	1	—
Dhobis	3	3	—
Old Men, Women, and Children having no occupation.	193	161	32
Total	465	357	108

E.

TABLE showing the ATTACKS and DEATHS according to CASTES.

Castes.	Population by Census of 1891.	Attacks.	Deaths.	Percentage of Attacks.	Percentage of Deaths.
Brahmans	1,793	38	34	2·1	1·8
Banniahs	2,361	19	15	·8	·6
Bhois	462	21	21	4·5	4·5
Kharwas	2,744	112	79	4·0	2·9
Khatris	445	11	11	2·5	2·5
Khawas	332	8	7	2·4	2·1
Kolis	317	2	2	0·6	0·6
Kumbhars	311	13	8	4·1	2·5
Luvanas	1,985	53	42	2·7	2·1
Salats	278	3	3	1·0	1·0
Bhangis	255	—	—	—	—
Other Hindus	3,029	69	46	—	—
Muhammadans	4,369	112	86	2·5	2·0
Parsees	57	4	3	7·0	5·0
Others	67	—	—	—	—
Total	18,805	465	357	2·4	1·9

F.

PLAGUE CASES and DEATHS classified according to AGES.

Age.	Attacks.	Deaths.
1 to 5 years	14	8
6 to 15 years	128	88
16 to 25 years	113	83
26 to 35 years	90	78
36 to 45 years	51	40
46 to 55 years	41	35
Over 55 years	28	25
Total	465	357

G.

TABLE showing PLAGUE ATTACKS and DEATHS during the PERIOD of EPIDEMIC, by SEXES.

Month.		Attacks.	Deaths.	Percentage of Recoveries.
May 17th to 31st	M.	15	11	26·6
	F.	27	18	33·3
Sex unknown		2	—	100·0
Total		44	29	34·0
June	M.	36	21	41·6
	F.	54	38	29·6
Total		90	59	34·4
July	M.	27	19	29·6
	F.	24	22	8·3
Total		51	41	19·6
August	M.	80	69	13·7
	F.	96	78	18·7
Total		176	147	16·3
September	M.	29	25	13·7
	F.	38	29	23·6
Total		67	54	19·4
October	M.	12	8	33·3
	F.	21	17	19·0
Total		33	25	24·2
November	M.	1	1	0
	F.	3	1	66·6
Total		4	2	50·
Total	M.	200	154	23·0
	F.	263	203	22·8
		2	0	100·0
		*	*	
Total		465	357	23·2

* These were indigenous. There were six imported cases and six deaths.

H.

STATEMENT showing the NUMBER of ADMISSIONS into different HOSPITALS from the 17th May 1898 to the end of November 1898.

Months.	Admitted.	Recovered.	Died.
May	36	0	22
June	83	11	53
July	30	22	22
August	63	13	29
September	32	30	20
October	27	14	18
November	3	18	2
Total	274	108	166

I.

TABLE showing the CLASSIFICATION according to the SITUATION of BUBOES.

Situation of Buboes.	Total.	Male.	Female.	Children.		Died.	Recovered.	Percentage of Mortality
				Girls.	Boys.			
Right Axilla	9	3	2	2	2	7	2	77·7
Left Axilla	24	4	9	2	9	15	9	62·5
Right groin	113	35	52	14	12	68	45	60·1
Left groin	95	40	35	11	9	57	38	60
Right side neck	11	4	2	0	5	6	5	54·5
Left side neck	7	2	3	1	1	5	2	71·4
Multiple Buboes	8	2	4	1	1	3	5	37·5
No Buboes	7	1	6	0	0	5	2	71·4
Total	274	91	113	31	39	166	108	60·4

J.

STATEMENT showing the PERIOD after ADMISSION to HOSPITALS at which DEATH took place in 166 CASES that proved fatal.

Moribund.	Period.											
5 Minutes to 22 Hours.	1st Day.	2nd Day.	3rd Day.	4th Day.	5th Day.	6th Day.	7th Day.	8th Day.	11th Day.	12th Day.	16th Day.	34th Day.
26	24	27	36	23	10	8	7	1	1	1	1	1

K.

STATEMENT showing the ATTACKS and DEATHS due to PLAGUE amongst various COMMUNITIES ADMITTED to the different HOSPITALS.

Caste.	Attacks.				Deaths.				Recoveries.				Per Cent. of Mortality.
	Male.	Female.	Children.	Total.	Male.	Female.	Children.	Total.	Male.	Female.	Children.	Total.	
Muhammedans.	14	19	7	40	6	8	2	16	8	11	5	24	40
Kharwas	27	49	36	112	17	31	24	72	10	18	12	40	4·2
Bhois	5	6	5	16	5	5	3	13	0	1	2	3	·2
Luvanas	16	7	6	26	14	4	0	18	2	3	3	8	69·2
Brahmans	6	5	4	15	5	4	2	11	1	1	2	4	73·3
Banniahs	2	3	3	8	1	1	0	2	1	2	3	6	25
Other Hindus.	20	23	11	54	14	8	10	32	6	15	1	22	59·2
Parsees	1	1	1	3	1	1	0	2	0	0	1	1	66·6
Total	91	113	70	274	63	62	41	166	28	51	29	108	60·5

L.

STATEMENT showing the several HEALTH CAMPS which were STARTED, with the NUMBER of INMATES that were ACCOMMODATED in each, in the Town of PORBANDOR.

Creek Observation Camp	3,631
Bhoi Camp	380
Memon Camp	269
Turia Camp	298
Pingara Camp	100
Fakir Camp	172
Khatki Camp	200
Sepoy Camp	547
Vora Camp	150
New Jail Camp	150
	5,897

APPENDIX No. L.

(*See* Question No. 14,063.)

STATISTICS

REGARDING EVACUATION ON THE OUTBREAK OF PLAGUE

IN

VILLAGES OF THE KAIRA DISTRICT OF BOMBAY, 1898-99,

PUT IN BY K. B. BOMANJI EDALJI MODI,

DISTRICT DEPUTY COLLECTOR.

I beg to submit herewith a copy of my letter, No. 138 of the 22nd January 1899, addressed to the Collector of Kaira, together with its accompanying statement which contains the information required. None of the persons employed on disinfection work were attacked, but some four Golas, who had gone to white-wash the disinfected houses got the disease. The letter is as follows:—

In all the villages where plague broke out complete evacuation was carried out, and the results are as shown in the accompanying statement. It will be seen that partial evacuation has not succeeded as in Umreth and Kalsar, where the rats from the infected locality brought the poison to healthy localities. Evacuation of the streets before the rats had been affected was successful in stamping out, or rather in preventing the spread of the disease, as will be seen from the cases of the villages of Lingda, Thamna, Sundalpura, and Hamidpura. In Lingda village an imported case occurred on the 25th October 1898. The people of the street were at once taken out into the fields, and the houses were disinfected with the solution of corrosive sublimate, and no more cases occurred. The village became re-infected on the 28th December 1898, when two cases occurred, one in each street. The streets were at once evacuated and the houses disinfected, and the whole village was turned out in two days. No more cases have occurred since then. In Thamna, a woman, who had gone there from Umreth, became ill on the 25th November 1898, and the whole of the family were at once taken out into the field, and also the whole street, consisting of 22 houses, was evacuated. The houses were all disinfected. The woman died, but the Hospital Assistant thought it was not plague; her two daughters were attacked, and one died on the 26th and the other on the 27th November. The husband of the woman also died subsequently. There were no cases in the village until it became re-infected on the 28th December 1898. In Sundalpura a Banniah of Umreth arrived on the 14th October 1898 and became ill on the same day. He was brought back to Umreth by his relatives on the 16th, when he died. The whole street in which he had lived at Sundalpura was evacuated and the houses disinfected, and there were no more cases. In Hamidpura a man of Umreth was found suffering on the 18th November 1898, and was at once removed out into the field. The whole street was evacuated and disinfected, and there were no more cases. If the evacuation is carried out before the rats get the infection it is successful in preventing the spread of the disease, and it appears that the rats take some two or three days to get infected. If once the rats get infected the whole village must be evacuated and thoroughly disinfected.

STATEMENTS showing the RESULTS of EVACUATION in the KAIRA DISTRICT.

A.

Taluka.	No.	Village.	Population, Census of 1891.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation. Commenced.	Date of Evacuation. Completed.	Cases. Date.	Cases. No.	Remarks.
Anand	1	Umreth	15,638	26.9.98	17.1.99	26.9.98	24.11.98	26.9.98	7	Six persons were found suffering from plague on the 26th September 1898 in the street called the Golwad; the whole street was evacuated on that day. The cases that occurred till the 4th October all occurred among the Golas, who had been taken out into the segregation camp.
								27.9.98	3	
								28.9.98	4	
								29.9.98	1	
								30.9.98	3	One case on the 4th and one on the 7th were of persons living in a street near the Golwad.
								1.10.98	1	
								4.10.98	3	The case on the 8th was of a person living in the segregation camp.
								7.10.98	2	The case on the 10th was of a woman that had gone away into the fields two days previously from the street near the Golwad.
								8.10.98	1	
								10.10.98	1	One of the three cases on the 13th was a boy living in a street at some distance from the first infected locality. The rats must have brought the poison there. This newly infected locality was ordered to be evacuated on the 16th October. The other two cases of the 13th took place in the camp among those brought there six days before.
								13.10.98	3	
									29	
								14.10.98	2	One of the two cases on the 14th October was of a Banniah who slept on the otta of his shop at night time in the infected locality, and the other was of a woman who lived in the newly infected street where case No. 27 took place on the 13th.
								16.10.98	2	
								23.10.98	2	
								25.10.98	2	
								27.10.98	2	One of the two cases on the 16th was of a Musalman living in a locality at some distance from the infected locality. The other case was that of a Banniah who lived in the recently infected street but had gone to Sundalpura and was brought back from there.
								28.10.98	2	
								29.10.98	7	

Taluka.	No.	Village.	Population, Census of 1891.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.		Cases.		Remarks.
						Commenced.	Completed.	Date.	No.	
Anand - - (*Continued.*)	1	Umreth - -	15,638	26.9.98	17.1.99	26.9.98	24.11.98	30.10.98	1	The two cases that occurred on the 23rd October were of Golas who had gone from the camp to whitewash their houses after they had been disinfected with perchloride of mercury solution. Either the houses were not properly disinfected or were newly poisoned by rats from non-disinfected houses.
								1.11.98	3	On the 25th October one case was of a Borah who lived in his shop near the infected locality, and the other was of a Banniah who went to a neighbouring village after taking the poison into his system from the infected locality. One of the two cases on the 27th October was of a woman in a street adjacent to the vacated locality, the other was of a person living in the camp since 20 days. How this man got the plague cannot be ascertained. He was a weak elderly person. He has now recovered. The two cases on the 28th October were of Golas who had been in the camp from the beginning. Very likely they got the poison from their disinfected houses which they had gone to whitewash. Of the seven cases on the 29th October two were of Golas who were in the camp but who must have gone to their houses which were to be whitewashed, one was of a girl segregated on the previous day, and four of persons living in the town in the localites near the evacuated places. On the 30th October the one case was of a Brahman living near the infected localities. The three cases on the 1st November were of persons living in a street that had just then been ordered to be evacuated.
								2.11.98	1	This was a boy about eight years' old, living in the camp since a long time; if it was plague, the cause of his getting it cannot be ascertained; he had large buboes on both sides of the neck; it might be a case of mumps. He is now recovered.
								3.11.98	1	The man lived in an infected locality.
								7.11.98	3	These three cases occurred among those living in the field since the 1st November 1898.
								8.11.98	5	One of these five cases occurred in the town, two in the segregation camp, where they had been brought from their houses since the 1st November, and two in the fields, where they were living since a long time, but had been coming to their houses.
								9.11.98	1	This woman was seized in the fields four days after, and she went to live there from her house in an infected locality.
								10.11.98	2	One of these two cases was in the segregation camp. He had gone to bury his relative that was attacked on the 8th. The other person was living in the vicinity of an infected locality.
								11.11.98	1	Attacked in the field six days after he went to live there from his house.
								12.11.98	5	One of these five cases had been living in the fields but had gone to the Rawaliawad, an infected locality; one lived in the fields but had come to his shop in an infected locality; one lived in a temple outside the town but had carried the poison in his body when he went out; one woman attacked in the segregation camp—she must have gone to her house, though she does not admit it; the fifth got it in the segregation camp a few days after she was brought there.
								13.11.88	4	Two of these were in the segregation camp. It is difficult to find the cause; none in the neighbouring huts was attacked; perhaps they must have gone to their houses. Two were attacked in the fields, but one of them was attacked within the period of incubation, and the other on account of her having gone to her house.
								17.11.98	1	Had been living in a healthy locality, but had gone to cook food in a house in an infected locality.
								18.11.98	1	This man used to go to his house to get a wall built.
								20.11.98	3	One of these three was seized in the field. where he had gone to live three days before. One had been living in the fields since a long time. No other person in his neighbourhood in the field attacked. One case in the Bhangi quarters, which had been free up to this time.
								24.11.98	2	Took the poison with them; the Dher and Chamar quarters evacuated on the 29th November.

Taluka.	No.	Village.	Population, Census of 1891.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.		Cases.		Remarks.
						Commenced.	Completed.	Date.	No.	
Anand - - (*Continued.*)	1	Umreth - -	15,638	26.9.98	17.1.99	26.9.98	24.11.98	25.11.98	1	Living in the fields since about a month. Very likely must have come to her house in the infected locality.
								26.11.98	1	Took the poison with her from the Chamar quarters, evacuated on the 20th November.
								27.11.98	1	Had been living in the field since 2nd November, but had gone to her house to bring grain.
								28.11.98	1	Was in the fields since 2nd November. No case in the adjoining huts or fields. Must have got the poison from his house.
								29.11.98	1	Took the poison in her body from her house, evacuated eight days previously.
								2.12.98	1	Took the poison with him from his house, evacuated ten days previously.
								3.12.98	2	One of these lived in the field since 2nd November, but used to go to her house stealthily; the other must have carried the poison in her body from her house, evacuated ten days previously.
								4.12.98	1	Lived in the fields from the beginning, but used to go to the Tran Pol, where her brother-in-law was employed as a watchman.
								6.12.98	1	In the Police lines in the midst of the town. After this case the lines were evacuated.
								7.12.98	3	In the fields, but had been coming to their houses in the town.
								8.12.98	1	Had been living in the fields since a long time, but used to go to his maternal uncle's house in an infected locality.
								12.12.98	1	The woman had been living out in the field since the 2nd November, but had come to her house in Jampli Bhugol, an infected locality.
								15.12.98	1	Was living at Hamidpura village, but had gone to his master's house at Umreth to bring firewood. He was attacked at Hamidpura and brought to a field of Umreth, where he died.
								17.12.98	2	One is a girl, living in the camp from the beginning, had gone to her house to look at the things, after the fall of rain on the 4th December. The other was a tailor who had been living at Hamidpura, an infected village, and who came back to Umreth when he was found to be suffering from plague.
								18.12.98	2	One of the two cases used to visit the house of her mistress, an old lady allowed to live in the town, and the other had come from Dagjipura, an infected village, and kept under observation in the camp.
								27.12.98	2	One used to go frequently to his house in Baji Bhat Jhapa by stealth. The other, a boy, had gone with his mother to the house; the mother has not suffered.
								29.12.98	1	The woman had been living in a house near the town.
								4.1.99	2	One of these had been living in the fields since a long time, but had gone to his house and swept the floors. The other had been living at the village of Ashipura, but had been coming to his house at Umreth, from Ashipura; he and his relatives went to live in a temple outside Dakor, when dead rats were seen there, they came back to Umreth and lived in a field where this man was attacked on the second day.
								6.1.99	1	The woman came with her family from Thamna, an infected village, on the 27th December, and lived in the fields, where she was seized on the 6th January.
								7.1.99	1	The man lived in the field, but had gone to Thamna, an infected village, to purchase ghee.
								17.1.99	1	He must have got the poison from his house.
Anand - -	2	Od - -	9,385 (including the hamlets, the town consists of about 8,000 inhabitants.)	21.11.98	9.1.99	22.11.98	25.11.98	21.11.98	4	All these persons belong to streets originally infected.
								23.11.98	2	
								24.11.98	2	
								25.11.98	1	
								26.11.98	2	
								27.11.98	1	
								28.11.98	3	
								29.11.98	1	
								30.11.98	2	
								1.12.98	1	
								2.12.98	3	
								3.12.98	2	
								4.12.98	6	

Taluka.	No.	Village.	Population, Census of 1891.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.		Cases.		Remarks.
						Commenced.	Completed.	Date.	No.	
Anand - - (*Continued.*)	2	Od - -	9,385	21.11.98	9.1.99	22.11.98	25.11.98	5.12.98	4	
								6.12.98	3	
								7.12.98	1	Belongs to the same family as that attacked on the 11th December.
								10.12.98	1	
								11.12.98	3	All the three are members of one family.
								15.12.98	1	These cases must have been caused by the people surreptitiously going to their vacated houses.
								23.12.98	1	
								30.12.98	1	
								5.1.99	1	
								6.1.99	1	
								9.1.99	1	
Anand -	3	Sili - -	3,411	2.11.98	31.12.98	22.11.98	27.11.98	22.11.98	2	The cases up to the 9th December may be taken as those within the period of incubation. The other two cases may be attributed to the persons having gone to their houses. No case up to date after the 31st December 1898.
								24.11.98	1	
								25.11.98	3	
								26.11.98	2	
								27.11.98	1	
								29.11.98	2	
								5.12.98	1	
								6.12.98	1	
								8.12.98	2	
								9.12.98	1	
								18.12.98	1	
								31.12.98	1	
									18	
Anand -	4	Sureli - -	2,330	12.11.98	14.1.99	22.11.98	24.11.98	12.11.98	2	The 48 cases up to the 4th December occurred within 10 days after evacuation. The remaining 11 cases may be due to the people having gone to their houses. No case after the 14th January.
								15.11.98	4	
								16.11.98	1	
								20.11.98	3	
								22.11.98	1	
								23.11.98	1	
								24.11.98	7	
								25.11.98	9	
								26.11.98	6	
								28.11.98	1	
								29.11.98	5	
								30.11.98	1	
								1.12.98	1	
								2.12.98	4	
								3.12.98	1	
								4.12.98	1	
								8.12.98	1	
								9.12.98	2	
								10.12.98	1	
								14.12.98	2	
								15.12.98	1	
								19.12.98	1	
								23.12.98	1	
								3.1.99	1	
								14.1.99	1	
									59	
Anand -	5	Khakhanpur	488	12.12.98	7.1.99	10.12.98	13.12.98	12.12.98	1	
								13.12.98	1	
								17.12.98	1	
								21.12.98	1	
								23.12.98	1	
								25.12.98	1	
								29.12.98	1	
								7.1.9	1	
									8	

Taluka.	No.	Village.	Population, Census of 1891.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.		Cases.		Remarks.
						Commenced.	Completed.	Date.	No.	
Anand - -	6	Behchri - -	887	8.12.98	14.1.99	9.12.98	12.12.98	8.12.98	2	The cases were among Diers and Pattidars living in one locality up to the 28th. No case after the 14th January.
								10.12.98	1	
								11.12.98	1	
								12.12.98	1	
								15.12.98	5	
								16.12.98	2	
								23.12.98	1	
								28.12.98	1	
								29.12.98	1	
								30.12.98	2	
								4.1.99	1	
								6.1.99	1	
								7.1.99	1	
								8.1.99	2	
								14.1.99	2	
									23	
Anand - -	7	Bhatpura -	1,010	13.12.98	14.1.99	14.12.98	17.12.98	12.12.98	2	The cases occurred among those living in two distinct localities. Those occurring after the 25th December may be due to the people having gone to their houses.
								13.12.98	6	
								14.12.98	2	
								15.12.98	4	
								16.12.98	1	
								17.12.98	1	
								18.12.98	1	
								19.12.98	5	
								20.12.98	1	
								21.12.98	1	
								24.12.98	1	
								25.12.98	1	
								30.12.98	1	
								5.1.99	1	
								6.1.99	1	
								14.1.99	1	
									30	
Anand - -	8	Hamidpura -	1,090	14.12.98	15.1.99	2.12.98	16.12.98	14.12.98	2	The cases on the 3rd and 15th January 1899, may be attributed to the persons having gone to their houses. No case after the 15th January.
								16.12.98	1	
								17.12.98	2	
								20.12.98	3	
								21.12.98	1	
								23.12.98	1	
								3.1.99	1	
								15.1.99	1	
									12	
Anand - -	9	Bhalaj -	4,002	10.12.98	19.1.99	11.12.98	15.12.98	10.12.98	4	33 out of the 38 cases occurred within ten days after evacuation.
								11.12.98	2	
								12.12.98	1	
								13.12.98	2	
								14.12.98	2	
								15.12.98	5	
								16.12.98	1	
								17.12.98	2	
								18.12.98	3	
								19.12.98	4	
								20.12.98	4	
								21.12.98	1	
								23.12.98	1	
								25.12.98	1	
								27.12.98	1	
								3.1.99	1	
								15.1.99	2	
								19.1.99	1	
									38	

Taluka.	No.	Village.	Population, Census of 1891.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.		Cases.		Remarks.
						Commenced.	Completed.	Date.	No.	
Anand - -	10	Dagjipura -	887	12.12.98	18.1.99	12.12.98	29.12.98	12.12.98	1	The cases on the 14th and 18th may have been owing to the persons having gone to their houses.
								18.12.98	1	
								24.12.98	1	
								3.1.99	1	
								14.1.99	1	
								18.1.99	1	
									6	
Anand - -	11	Ratanura -	1,751	25.12.98	12.1.99	25.12.98	27.12.98	25.12.98	5	No case after the 12th January.
								27.12.98	4	
								7.1.99	1	
								12.1.99	1	
									11	
Thasra - -	12	Dhunodra	2,413	20.11.98	20.1.99	25.11.98	5.12.98	20.11.98	2	
								21.11.98	2	
								25.11.98	4	
								27.11.98	1	
								28.11.98	1	
								29.11.98	1	
								5.12.98	1	
								6.12.98	1	
								10.12.98	1	
								12.12.98	1	
								17.12.98	1	
								19.12.98	1	
								1.1.99	1	
								2.1.99	1	
								4.1.99	1	
								7.1.99	1	This man was employed as a labourer to remove the tiles of a house.
								10.1.99	1	
								12.1.99	1	
								16.1.99	2	
								18.1.99	1	
									26	
Thasra - -	13	Vanoti -	1,715	3.12.98	17.1.99	4.12.9	7.12.98	3.12.98	6	
								4.12.98	2	
								6.12.98	2	
								7.12.98	1	
								8.12.98	3	
								9.12.98	6	
								10.12.98	3	
								11.12.98	2	
								12.12.98	3	
								13.12.98	2	
								14.12.98	1	
								15.12.98	3	
								16.12.98	2	
								7.12.98	1	
								18.12.98	1	
								20.12.98	1	
								21.12.98	2	
								24.12.98	1	
								After the 24th December.	16	
									58	

Taluka.	No.	Village.	Population, Census of 1891.	Date of First Case of Plague.	Date of Last Case of Plague.	Date of Evacuation.		Cases.		Remarks.
						Commenced.	Completed.	Date.	No.	
Thasra	14	Pandwánia	1,108	2.12.98	20.1.99	5.12.98	8.12.98	2.12.98	1	The cases after the 17th December may be ascribed to the people having gone to their houses.
								4.12.98	2	
								6.12.98	1	
								9.12.98	1	
								17.12.98	1	
								28.12.98	1	
								30.12.98	1	
								31.12.98	1	
								5.1.99	2	
								After the 5th January	3	
									14	
Thasra	15	Kuni	1,652	13.12.98	20.1.99	12.12.98	13.12.98	13.12.98	2	
								14.12.98	12	
								15.12.98	2	
								16.12.98	2	
								20.12.98	1	
								21.12.98	3	
								22.12.98	2	
								24.12.98	1	
								27.12.98	1	
								30.12.98	1	
								31.12.98	2	After the 1st January a distant hamlet of the village got infested.
Thasra	16	Deda, hamlet of Sui.	174	9.12.98	16.1.99	10.12.98	11.12.98	9.12.98	11	
								12.12.98	4	
								13.12.98	1	
								14.12.98	1	
								15.12.98	1	
								16.12.98	3	
								19.12.98	2	
								22.12.98	1	
								24.12.98	1	
								27.12.98	2	
								31.12.98	1	
								4.1.99	1	
								16.1.99	1	
									31	
Thasra	17	Kalsar	2,743	17.12.98	20.1.99	25.12.98	11.1.99	17.12.98	3	All these cases were among the Dhers and Chamars, who were all turned out on the first day. No cases have occurred among these after the 28th.
								19.12.98	2	
								21.12.98	1	
								23.12.98	1	
								25.12.98	3	
								26.12.98	1	
								28.12.98	1	
								4.1.99	1	
								5.1.99	2	Cases began to occur from the 5th in the portion not evacuated. This case shows that partial evacuation was not successful.
								7.1.99	2	
								9.1.99	3	
								10.1.99	1	
								12.1.99	3	
								After the 12th	11	
									35	

D.

Town or Village.	1. Population immediately before Outbreak.	2. Yearly Average Death-rate in Years when there was no Plague.	3. Average Weekly Population for each Week when Plague was Epidemic. Week.	3. Population.	4. Total Mortality from *all Causes* Week by Week during Plague. Week.	4. Deaths.	5. Total Mortality from *Plague* alone Week by Week. Week.	5. Deaths.	6. Total Number of Contacts Segregated and the Average Period of their Detention. No.	6. Average.	7. Average Population of Contact Camp Week by Week. Week.	7. Population.	8. Total Weekly Mortality from *all Causes* in Contact Camps. Week.	8. Deaths.	9. Total Mortality from Plague Week by Week in Contact Camps. Week.	9. Deaths.
Umreth	Not taken.	651	1st	Not taken	1st	26	1st	14	915	12 days	—	—	1st	14	1st	13
			2nd		2nd	20	2nd	5					2nd	5	2nd	
			3rd		3rd	18	3rd	5					3rd	1	3rd	1
			4th	11,019	4th	14	4th	4					4th	1	4th	
			5th	11,072	5th	30	5th	9					5th		5th	
			6th	9,943	6th	29	6th	8					6th		6th	
			7th	9,941	7th	31	7th	13					7th		7th	
			8th	9,236	8th	25	8th	5					8th		8th	
			9th	8,775	9th	24	9th	6					9th		9th	0
			10th	9,737	10th	20	10th	4					10th	0	10th	
			11th	9,464	11th	16	11th	6					11th		11th	
			12th	9,728	12th	11	12th	3					12th		12th	
			13th	9,946	13th	17	13th	2					13th		13th	
			14th	10,222	14th	9	14th	2					14th		14th	
			15th	10,115	15th	18	15th	4					15th		15th	
						308		90								
Sureli	2,027	43	1st	2,627	1st	26	1st	25	42	12 days	—	—	1st	0	1st	0
			2nd	1,806	2nd	12	2nd	11					2nd	0	2nd	0
			3rd	1,794	3rd	4	3rd	3					3rd	0	3rd	0
			4th	1,792	4th	2	4th	2					4th	1	4th	1
			5th	1,791	5th	1	5th	1					5th	1	5th	1
			6th	1,790	6th	1	6th	1					6th	0	6th	0
			7th	1,788	7th	2	7th	0					7th	0	7th	0
								43								
Od	7,874	307	1st	7,812	1st	18	1st	9	157	10 days	—	—	1st	9	1st	8
			2nd	7,214	2nd	14	2nd	9					2nd	9	2nd	9
			3rd	7,191	3rd	15	3rd	13					3rd	13	3rd	11
			4th	7,172	4th	8	4th	3					4th	3	4th	3
			5th	7,159	5th	7	5th	1					5th	1	5th	1
			6th	7,151	6th	3	6th	1					6th	1	6th	1
			7th	7,142	7th	12	7th	2					7th	2	7th	2
			8th	7,130	8th	0	8th	0					8th	0	8th	0
Sili	2,959	95	1st	2,945	1st	11	1st	7	36	10 days	—	—	1st	0	1st	0
			2nd	2,935	2nd	5	2nd	3					2nd	1	2nd	1
			3rd	2,940	3rd	5	3rd	4					3rd	1	3rd	1
			4th	2,942	4th	2	4th	1					4th	0	4th	0
			5th	2,945	5th	1	5th	0					5th	0	5th	0
			6th	2,950	6th	2	6th	1					6th	0	6th	0
								16								
Behchri	941	32	1st	939	1st	3	1st	3	21	10 days.						
			2nd	949	2nd	2	2nd	2								
			3rd	947	3rd	2	3rd	1								
			4th	950	4th	2	4th	2								
			5th	945	5th	5	5th	4								
								12								

Town or Village.	1. Population immediately before Outbreak.	2. Yearly Average Death-rate in Years when there was no Plague.	3. Average Weekly Population for each Week when Plague was Epidemic.		4. Total Mortality from *all Causes* Week by Week during Plague.		5. Total Mortality from *Plague* alone Week by Week.		6. Total Number of Contacts Segregated and the Average Period of their Detention.		7. Average Population of Contact Camp Week by Week.		8. Total Weekly Mortality from *all Causes* in Contact Camps.		9. Total Mortality from Plague Week by Week in Contact Camps.	
			Week.	Population.	Week.	Deaths.	Week.	Deaths.	No.	Average.	Week.	Population.	Week.	Deaths.	Week.	Deaths.
Bhálaj -	4,069	119	1st	3,820	1st	18	1st	14	63	10 days.						
			2nd	3,803	2nd	16	2nd	11								
			3rd	3,803	3rd	4	3rd	3								
			4th	3,818	4th	0	4th	0								
					5th	2	5th	0								
								28								
Bhatpurá -	1,119	27	1st	1,104	1st	13	1st	12	34	10 days.						
			2nd	1,088	2nd	8	2nd	8								
			3rd	1,086	3rd	3	3rd	2								
			4th	1,081	4th	5	4th	3								
								25								
Khakhanpar -	435	12	1st	435	1st	3	1st	3	15	12 days.						
			2nd	430	2nd	2	2nd	1								
			3rd	428	3rd	2	3rd	1								
								5								
Dagjipura -	1,053	27	1st	1,053	1st	2	1st	1	11	10 days.						
			2nd	1,034	2nd	1	2nd	0								
			3rd	1,024	3rd	1	2rd	1								
			4th	1,017	4th	1	4th	1								
								3								
Hamidpura -	1,184	35	1st	1,143	1st	16	1st	4	21	10 days.						
			2nd	1,134	2nd	18	2nd	6								
			3rd	1,132	3rd	1	3rd	0								
			4th	1,125	4th	1	4th	1								
								11								
Ratanpura -	1,659	60	1st	1,529	1st	8	1st	2	30	12 days	—	—	1st	1	1st	0
			2nd	1,520	2nd	6	2nd	3								
								5								
Thamna -	3,169	120	1st	2,864	1st	17	1st	10	29	8 days.						
			2nd	2,844	2nd	15	2nd	2								
			3rd	2,830	3rd	0	3rd	0								
								12								
Pansorá -	2,089	63	1st	2,036	1st	11	1st	9	4	10 days	—	—	1st	0	1st	0
			2nd	2,025	2nd	4	2nd	3					2nd	2	2nd	2
			3rd	2,021	3rd	0	3rd	0								
								12								
Lingdá -	1,742	84	1st	1,645	1st	4	1st	2	11	10 days.						
			2nd	1,643	2nd	1	2nd	0								
								2								

Town or Village.	1. Population immediately before Outbreak.	2. Yearly Average Death-rate in Years when there was no Plague.	3. Average Weekly Population for each Week when Plague was Epidemic.		4. Total Mortality from *all Causes* Week by Week during Plague.		5. Total Mortality from *Plague* alone Week by Week.		6. Total Number of Contacts Segregated and the Average Period of their Detention.		7. Average Population of Contact Camp Week by Week.		8. Total Weekly Mortality from *all Causes* in Contact Camps.		9. Total Mortality from Plague Week by Week in Contact Camps.	
			Week.	Population.	Week.	Deaths.	Week.	Deaths.	No.	Average.	Week.	Population.	Week.	Deaths.	Week.	Deaths.
Dhunodrá	2,472	68	1st	2,514	1st	6	1st	5	27	10 days	—	—	1st	0	1st	0
			2nd	2,306	2nd	4	2nd	3					2nd	0	2nd	0
			3rd	2,295	3rd	3	3rd	3					3rd	0	3rd	0
			4th	2,292	4th	5	4th	2					4th	1	4th	1
			5th	2,289	5th	2	5th	0					5th	0	5th	0
			6th	2,285	6th	1	6th	1					6th	0	6th	0
			7th	2,284	7th	4	7th	4					7th	0	7th	0
								18								
Manjipurá	728	18	1st	709	1st	2	1st	2	17	10 days.						
			2nd	707	2nd	0	2nd	0								
								2								
Pandwania	1,250	34	1st	1,076	1st	4	1st	3	26	10 days.						
			2nd	1,072	2nd	3	2nd	0								
			3rd	1,096	3rd	1	3rd	0								
			4th	1,068	4th	1	4th	1								
			5th	1,067	5th	5	5th	3								
			6th	1,062	6th	0	6th	0								
								7								
Vanoti	1,530	77	1st	1,530	1st	9	1st	7	97	10 days	—	—	1st	1	1st	1
			2nd	1,519	2nd	13	2nd	12					2nd	1	2nd	0
			3rd	1,505	3rd	9	3rd	7					3rd	—	3rd	0
													4th	—	4th	0
								26								
Sui hamlet Dedá.	1,040	—	1st	1,025	1st	15	1st	10	71	10 days	—	—	1st	0	1st	0
			2nd	1,039	2nd	6	2nd	6					2nd	2	2nd	2
			3rd	1,017	3rd	4	3rd	4					3rd	0		
			4th	1,011	4th	3	4th	3								
								23								
Kuni	1,569	39	1st	1,556	1st	13	1st	11	89	10 days	—	—	1st	—	1st	—
			2nd	1,549	2nd	7	2nd	5					2nd	—	2nd	—
			3rd	1,544	3rd	5	3rd	2					3rd	—	3rd	—
			4th	1,532	4th	12	4th	9					4th	1	4th	1
								27								
Kálsar	2,813	78	1st	2,813	1st	7	1st	3	53	10 days.						
			2nd	2,806	2nd	9	2nd	4								
			3rd	2,796	3rd	6	3rd	4								
			4th	2,789	4th	—	4th	—								
								11								
Rakhiál	1,193	40	1st	1,193	1st	4	1st	3	20	10 days.						
			2nd	1,187	2nd	3	2nd	2								
			3rd	1,183	3rd	—	3rd	—								
								5								

BOMANJI E. MODI,
District Deputy Collector of Kaira.

APPENDIX No. LI.

(*See* Question No. 14,655.)

STATEMENT of INFECTED VILLAGES in the BARODA DIVISION of the BARODA STATE during the OFFICIAL YEAR 1897-98—showing RESULTS of EVACUATION.

Serial No.	Name of Infected Village.	Population.	Total Cases before Evacuation.	Date of Evacuation.	Daily Attacks during each of the Ten Days after Evacuation.		Total No. of Attacks after the Ten Days until Epidemic ceased.	Date of the Last Case.	Remarks.
					Date.	Cases.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
				PARTIAL EVACUATION.					
1	Undhera -	1,024	66	14th January 1898	15th January 1898	2	None	25th March 1898	Half portion of the village had become infected at first. Outside the City of Baroda plague first appeared in this village. For experiment's sake only that part of the village was vacated in which cases of plague had occurred, the other half being separated from the infected half-portion by a road passing between the two, was left undisturbed.
					16th „ „	7			
					17th „ „	4			
					18th „ „	5			
					19th „ „	3			
					20th „ „	—			
					21st „ „	—			
					22nd „ „	—			
					23rd „ „	—			
					24th „ „	1			
						22			
				COMPLETE EVACUATION.					
			76*	10th March 1898 -	11th March 1898 -	—	2	—	Plague not having stopped after the evacuation of the infected half portion of the village, the whole village was subsequently evacuated.
					12th „ „ -	—			* Cases between the 14th January and 10th March, 1898.
					13th „ „ -	—			
					14th „ „ -	—			
					15th „ „ -	—			
					16th „ „ -	—			
					17th „ „ -	—			
					18th „ „ -	—			
					19th „ „ -	1			
					20th „ „ -	—			
			142†			1	2		† This figure includes two cases which occurred in a small village situated in the vicinity of Undera.
				PARTIAL EVACUATION.					
2	Koili -	3,695	23	28th February 1898	1st March 1898 -	1	—	2nd May 1898 -	In the middle of January 1898 three cases of plague had occurred in this village. They were supposed to be imported cases and measures were taken to segregate inmates of infected houses only, and to disinfect the latter.
					2nd „ „ -	3			
					3rd „ „ -	—			
					4th „ „ -	—			
					5th „ „ -	1			
					6th „ „ -	—			
					7th „ „ -	3			
					8th „ „ -	4			
					9th „ „ -	3			
					10th „ „ -	—			
						15			
				COMPLETE EVACUATION.					
			96	2nd April 1898 -	3rd April 1878 -	5	9	—	In the middle of February 1898, plague cases again occurred in the village. As at Undhera the infected localities were evacuated, and the persons living in the non-infected streets were allowed to remain inside the village.
					4th „ „ -	—			Plague not having stopped after partial evacuation, complete evacuation was effected.
					5th „ „ -	6			
					6th „ „ -	4			
					7th „ „ -	—			
					8th „ „ -	—			
					9th „ „ -	—			
					10th „ „ -	—			
					11th „ „ -	4			
					12th „ „ -	3			
			119			22	9		

STATEMENT of INFECTED VILLAGES in the BARODA DIVISION of the BARODA STATE during the OFFICIAL YEAR 1897-98—showing RESULTS of EVACUATION—*continued*.

Serial No.	Name of Infected Village.	Population.	Total Cases before Evacuation.	Date of Evacuation.	Daily Attacks during each of the Ten Days after Evacuation.		Total No. of Attacks after the Ten Days until Epidemic ceased.	Date of the Last Case.	Remarks.
					Date.	Cases.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
3	Ankodiya -	996	2	15th April 1898 -	16th April 1898 -	—	3	21st May 1898 -	On the 10th January 1898 one case of plague had occurred. It was a case imported from Baroda. During the last week in the month of March plague again appeared in the village, and subsequently the whole village was evacuated.
					17th „ „ -	1			
					18th „ „ -	—			
					19th „ „ -	—			
					20th „ „ -	—			
					21st „ „ -	—			
					22nd „ „ -	—			
					23rd „ „ -	—			
					24th „ „ -	—			
					25th „ „ -	2			
			2			3	3		
4	Jelálpur -	650	3	8th March 1898 -	9th March 1898 -	—	2	21st March 1898	
					10th „ „ -	—			
					11th „ „ -	—			
					12th „ „ -	1			
					13th „ „ -	—			
					14th „ „ -	—			
					15th „ „ -	—			
					16th „ „ -	—			
					17th „ „ -	—			
					18th „ „ -	—			
			3			1	2		
				PARTIAL EVACUATION.					
5	Bajwa - -	703	9	23rd February 1898	24th February 1898	1	None	30th March 1898	
					25th „ „	—			
					26th „ „	1			
					27th „ „	—			
					28th „ „	3			
					1st March „	4			
					2nd „ „	3			
					3rd „ „	1			
					4th „ „	1			
					5th „ „	—			
						14			
				COMPLETE EVACUATION.					
			34	28th March 1898 -	29th March 1898 -	—			
					30th „ „ -	1			
					31st „ „ -	—			
					1st April 1898 -	—			
					2nd „ „ -	—			
					3rd „ „ -	—			
					4th „ „ -	—			
					5th „ „ -	—			
					6th „ „ -	—			
					7th „ „ -	—			
			43			1			

STATEMENT of INFECTED VILLAGES in the BARODA DIVISION of the BARODA STATE during the OFFICIAL YEAR 1897-98—showing RESULTS of EVACUATION—*continued.*

Serial No.	Name of Infected Village.	Population.	Total Cases before Evacuation.	Date of Evacuation.	Daily Attacks during each of the Ten Days after Evacuation.		Total No. of Attacks after the Ten Days until Epidemic ceased.	Date of the Last Case.	Remarks.
					Date.	Cases.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
6	Darjipur	368	4	18th February 1898	19th February 1898	—	None	26th February 1898.	
					20th „ „	—			
					21st „ „	—			
					22nd „ „	—			
					23rd „ „	—			
					24th „ „	—			
					25th „ „	—			
					26th „ „	1			
					27th „ „	—			
					28th „ „	—			
			4			1			
7	Kantharinya	364	12	25th February 1898	26th February 1898	—		11th March 1898	
					27th „ „	—			
					28th „ „	—			
					1st March „	—			
					2nd „ „	—			
					3rd „ „	—			
					4th „ „	1			
					5th „ „	—			
					6th „ „	—			
					7th „ „	—			
			12			1	2		
				PARTIAL EVACUATION.					
8	Sankarda	2,115	42	10th March 1898	11th March 1898	1	None	3rd May 1898	The people of Sankarda would not like to camp out. Before the riots of Savali attempt was made to evacuate the village. But with great effort the Plague Authorities concerned could take out only those people who lived in infected portions. It was after the riots of Savali that complete evacuation was successful.
					12th „ „	1			
					13th „ „	—			
					14th „ „	1			
					15th „ „	—			
					16th „ „	4			
					17th „ „	—			
					18th „ „	—			
					19th „ „	—			
					20th „ „	1			
						8			
				COMPLETE EVACUATION.					
			50	30th April 1898	1st May 1898	1			
					2nd „ „	—			
					3rd „ „	1			
					4th „ „	—			
					5th „ „	—			
					6th „ „	—			
					7th „ „	—			
					8th „ „	—			
					9th „ „	—			
					10th „ „	—			
			92			2			

STATEMENT of INFECTED VILLAGES in the BARODA DIVISION of the BARODA STATE during the OFFICIAL YEAR 1897-98—showing RESULTS of EVACUATION—*continued*.

Serial No.	Name of Infected Village.	Population.	Total Cases before Evacuation.	Date of Evacuation.	Daily Attacks during each of the Ten Days after Evacuation.		Total No. of Attacks after the Ten Days until Epidemic ceased.	Date of the Last Case.	Remarks.
					Date.	Cases.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
9	Padra - -	8,415	12	10th March 1898 -	11th March 1898 -	—	9	27th Mar. 1898.	
					12th „ „ -	—			
					13th „ „ -	1			
					14th „ „ -	—			
					15th „ „ -	1			
					16th „ „ -	—			
					17th „ „ -	1			
					18th „ „ -	—			
					19th „ „ -	1			
					20th „ „ -	—			
			12			4	9		
10	Ratanpur -	748	65	24th March 1898 -	25th March 1898	2	None	28th Mar. 1898.	
					26th „ „ -	2			
					27th „ „ -	1			
					28th „ „ -	1			
					29th „ „ -	—			
					30th „ „ -	—			
					31st „ „ -	—			
					1st April „ -	—			
					2nd „ „ -	—			
					3rd „ „ -	—			
			65			6	—		
11	Nijampur -	439	2	8th March 1898 -	9th March 1898 -	—	7	16th April 1898.	
					10th „ „ -	—			
					11th „ „ -	—			
					12th „ „ -	1			
					13th „ „ -	—			
					14th „ „ -	—			
					15th „ „ -	1			
					16th „ „ -	—			
					17th „ „ -	—			
					18th „ „ -	—			
			2			2	7		
12	Mochiyapura	442	—	28th Feb. 1898 -	1st March 1898 -	—	None	26th Feb. 1898.	
					2nd „ „ -	—			
					3rd „ „ -	—			
					4th „ „ -	—			
					5th „ „ -	—			
					6th „ „ -	—			
					th „ „ -	—			
					8th „ „ -	—			
					9th „ „ -	—			
					10th „ „ -	—			
			—			—	—		

STATEMENT of INFECTED VILLAGES in the BARODA DIVISION of the BARODA STATE during the OFFICIAL YEAR 1897-98—showing RESULTS of EVACUATION—*continued*.

Serial No.	Name of Infected Village.	Population.	Total Cases before Evacuation.	Date of Evacuation.	Daily Attacks during each of the Ten Days after Evacuation.		Total No. of Attacks after the Ten Days until Epidemic ceased.	Date of the Last Case.	Remarks.
					Date.	Cases.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
13	Chandod -	3,282	57	25th April 1898 -	26th April 1898 -	—	None	29th April 1898.	
					27th „ „ -	—			
					28th „ „ -	—			
					29th „ „ -	1			
					30th „ „ -	—			
					1st May „ -	—			
					2nd „ „ -	—			
					3rd „ „ -	—			
					4th „ „ -	—			
					5th „ „ -	—			
			57			1			
14	Vasana -	1,165	19	20th March 1898 -	21st March 1898 -	1	2	8th April 1898.	
					22nd „ „ -	—			
					23rd „ „ -	1			
					24th „ „ -	1			
					25th „ „ -	—			
					26th „ „ -	—			
					27th „ „ -	—			
					28th „ „ -	—			
					29th „ „ -	—			
					30th „ „ -	—			
			19			3	2		
15	Karodiya -	526	8	20th March 1898 -	21st March 1898 -	—	8	18th April 1898	
					22nd „ „ -	—			
					23rd „ „ -	1			
					24th „ „ -	—			
					25th „ „ -	1			
					26th „ „ -	—			
					27th „ „ -	4			
					28th „ „ -	—			
					29th „ „ -	—			
					30th „ „ -	—			
			8			6	8		
16	Jarod - -	2,137	11	30th March 1898 -	31st March 1898 -	1	7	20th April 1898	
					1st April „ -	—			
					2nd „ „ -	—			
					3rd „ „ -	—			
					4th „ „ -	—			
					5th „ „ -	—			
					6th „ „ -	—			
					7th „ „ -	—			
					8th „ „ -	—			
					9th „ „ -	5			
			11			6	7		

STATEMENT of INFECTED VILLAGES in the BARODA DIVISION of the BARODA STATE during the OFFICIAL YEAR 1897-98—showing RESULTS of EVACUATION—*continued.*

Serial No.	Name of Infected Village.	Population.	Total Cases before Evacuation.	Date of Evacuation.	Daily Attacks during each of the Ten Days after Evacuation.		Total No. of Attacks after the Ten Days until Epidemic ceased.	Date of the Last Case.	Remarks.
					Date.	Cases.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
17	Harni -	878	13	12th April 1898 -	13th April 1898 -	—	6	29th April 1898.	
					14th „ „ -	—			
					15th „ „ -	—			
					16th „ „ -	—			
					17th „ „ -	—			
					16th „ „ -	—			
					17th „ „ -	—			
					18th „ „ -	—			
					19th „ „ -	—			
					20th „ „ -	—			
			13				6		
18	Chhani -	4,000	31	30th March 1898 -	31st March 1898 -	3	21	29th April 1898.	
					1st April „ -	3			
					2nd „ „ -	3			
					3rd „ „ -	3			
					4th „ „ -	1			
					5th „ „ -	1			
					6th „ „ -	1			
					7th „ „ -	2			
					8th „ „ -	1			
					9th „ „ -	—			
			31			18	21		
				PARTIAL EVACUATION.					
19	Savali	6,551	58	24th April 1898 -	25th April 1898 -	2	—	27th October 1898	The people of Savali persistently opposed plague measures. On the 21st April they committed a riot which we quelled, and the whole population was taken out subsequently. They, however, could not remain out for more than a week, owing to early rains. Camping out during the rains was impracticable, during which time plague did much mischief at Savali.
					26th „ „ -	1			
					27th „ „ -	2			
					28th „ „ -	—			
					29th „ „ -	2			
					30th „ „ -	2			
					1st May „ -	1			
					2nd „ „ -	1			
					3rd „ „ -	—			
					4th „ „ -	—			
						11			
				COMPLETE EVACUATION.					
			440	5th October 1898 -	6th October 1898 -	3	5		
					7th „ „ -	1			
					8th „ „ -	—			
					9th „ „ -	—			
					10th „ „ -	—			
					11th „ „ -	—			
					12th „ „ -	—			
					13th „ „ -	—			
					14th „ „ -	—			
					15th „ „ -	—			
			498			4	5		

STATEMENT of INFECTED VILLAGES in the BARODA DIVISION of the BARODA STATE during the OFFICIAL YEAR 1897-98—showing RESULTS of EVACUATION.—*continued.*

Serial No.	Name of Infected Village.	Population.	Total Cases before Evacuation.	Date of Evacuation.	Daily Attacks during each of the Ten Days after Evacuation.		Total No. of Attacks after the Ten Days until Epidemic ceased.	Date of the Last Case.	Remarks.
					Date.	Cases.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
20	Bhaniyara -	988	8	10th April 1898 -	11th April 1898 -	—	None	10th April 1898	
					12th „ „ -	—			
					13th „ „ -	—			
					14th „ „ -	—			
					15th „ „ -	—			
					16th „ „ -	—			
					17th „ „ -	—			
					18th „ „ -	—			
					19th „ „ -	—			
					20th „ „ -	—			
			8			—			
21	Sandhasal -	2,551	256	2nd October 1898	3rd October 1898	—	—	7th October 1898	This village became infected in the month of July, when, owing to rains, evacuation was impossible. People were, therefore, camped out after the rains.
					4th „ „	1			
					5th „ „	—			
					6th „ „	—			
					7th „ „	1			
					8th „ „	—			
					9th „ „	—			
					10th „ „	—			
					11th „ „	—			
					12th „ „	—			
			256			2			

N.B.—During the official* year of 1897-98 altogether 39 villages had become infected. Complete evacuation was not adopted where imported cases of plague had occurred. Such villages have been omitted from the above list. They are:—

(1) Akota; (2) Dumad; (3) Gotri; (4) Sukhalipur; (5) Majalpur; (6) Danteshwar; (7) Kolua; (8) Tatarpur; (9) Karjan; (10) Sankheda; (11) Darapura; (12) Ghaij; (13) Dabhoi; (14) Ranu; (15) Ekalbara; (16) Goriad; (17) Kapurai; (18) Padamla.

* The Baroda official year commences with 1st August of each calendar year and ends with the 31st July of the next calendar year.

APPENDIX No. LII.

FURTHER REPORT ON INOCULATION

WITH

M. HAFFKINE'S PROPHYLACTIC

IN

THE BARODA STATE,

SUBMITTED BY

MR. DHANJIBHAI H. MEHTA,

MEDICAL OFFICER, PLAGUE DUTY, BARODA,

AFTER HIS

EXAMINATION BEFORE THE INDIAN PLAGUE COMMISSION.

Effect of Inoculation on Plague in the whole State.

On a general review it is evident that inoculation not only lessens the number of attacks, but it also lessens the case-mortality, the attacks per 1,000 of population being 10·9 in inoculated, against 17·4 in the uninoculated, and the deaths per 1,000 of population being 6·9 against 13·1.

In 11 villages no inoculated person was attacked, though a greater or less number of cases continued to occur amongst the uninoculated.

In 7 places attacks did occur amongst the inoculated also. If the results of these are added up, the number of attacks per mille of population is 24·3 in inoculated against 53·8 in the others, and of deaths 55·4 against 46·9. The results of Undhera, Koili, and Bajwa are very good, and of Billimora and Kantharia very fair. The effect on case-mortality at Savali is also fairly good.

Effect of Inoculation on the General Mortality (from all Causes other than Plague) in the State.

The results appear very much in favour of the inoculated on the whole (9·3 against 20·6 per mille). But when deaths in children under 2 and old men over 60 are deducted (for there were very few inoculated of those ages), the difference in death-rate per 1,000 of population is much less (9·3 against 12·4). Thus a decent margin is still left in favour of the inoculated. That, however, is probably the case, because mostly healthy persons between 25 and 45 came forward for inoculation everywhere.

Clinical Aspect of Cases in Inoculated.

Out of the 60 cases that occurred in the whole of the State, 7 were pneumonic, 44 were bubonic, and the history of 9 cases is not known.

Does Inoculation increase the spread of Plague amongst the Uninoculated?

On reviewing the state of things in 25 inoculated and 30 uninoculated villages in the whole of the State, it appears that inoculation has decidedly no such ill-effect as asked in the question, and that the plague mortality is high or low only in accordance with the virulence of the poison.

The dates of the first and last cases in each village have been given in column No. 8 (Prevalence of Epidemic from Date to Date) of Appendice U, V, and W, &c.

I got all the information about all the villages, except Billimora, Dhamdachha, and Gandevi, from the office of the Chief Medical Officer, Baroda State, where a book is kept in which details about daily attacks and deaths in each village are entered in conformity with reports received from the various medical subordinates.

About the three villages above mentioned, I have put down the dates from the Appendice submitted in my first report, put before the Commission as the précis of my evidence.

Two misprints appear to have occurred as regards the dates of last cases; one of Savali, which ought to be 30th October 1898, instead of 13th October 1898, and the other of Sidhpur, which should be 12th December 1898 instead of 19th December 1898.

I may be allowed to add here that, though a case occurred at Ajrai on 18th October 1897, it was not taken into account because it was an imported one.

DHANJIBHAI H. MEHTA.
Medical Officer, Plague Duty, Baroda.

March 1899.

NOTES ON INOCULATION in the BARODA STATE.

I.—BILLIMORA.

(1.) As the statement of castes (*vide* Question No. 14,855) contained only approximate figures as gathered from a census taken on 18th and 19th January 1899, another has been prepared by adding to it the numbers that had died from all causes in the different castes from 1st April 1898 to 18th January 1899. It would show much more exactly the state of the population as it existed just before the commencement of inoculation, though here too, one factor (that of the persons who may have escaped to other parts during the epidemic, and may have subsequently returned) has to be considered.

(2.) AMENDED STATEMENT of INOCULATED AND UNINOCULATED with RESULTS per CASTES.

Caste.	Population.		Attacks.		Deaths.		Per-centage of attacks.		Per-centage of case Deaths.		Per-centage of deaths on Population.		Reduction in mortality per cent.	Case in uninoculated after 1st inoculation and before the attack amongst the inoculated.
	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.		
Anavlas	53	230	—	4	—	3	—	1·7	—	75·0	—	1·3	—	
Banniahs	7	730	—	4	—	3	—	0·5	—	75·0	—	0·4	—	
Barodias	3	11	—	—	—	—	—	—	—	—	—	—	—	Not known.
Bhois	1	—	—	—	—	—	—	—	—	—	—	—	—	
Brahmans	22	58	—	2	—	1	—	3·4	—	50·0	—	1·7	—	
Darzis	2	71	—	10	—	8	—	14·08	—	80·0	—	11·2	—	
Dhers	1	73	—	—	—	—	—	—	—	—	—	—	—	
Dublas	44	170	2	17	2	16	4·5	10·0	100·0	94·1	4·5	9·4	51·7	1
Ghanchis	46	268	2	15	1	11	4·3	5·5	50·0	73·3	2·1	4·1	47·0	1
Golas	56	193	5	15	3	15	8·9	7·7	60·0	100·0	5·3	7·7	31·0	5
Jains	9	211	—	20	—	15	—	9·4	—	75·0	—	7·1	—	Not known.
Kachhias	2	8	—	—	—	—	—	—	—	—	—	—	—	
Kolis	17	224	1	5	—	5	5·8	2·2	—	100·0	—	2·2	100·0	1
Kumbhars	18	157	3	13	3	10	8·9	8·2	100·0	76·9	8·9	6·3	—	None
Lohars	4	15	—	1	—	1	—	6·6	—	100·0	—	6·6	—	Not known.
Machhis	3	863	—	28	—	24	—	3·2	—	85·7	—	2·7	—	
Mahrattis	2	1	—	—	—	—	—	—	—	—	—	—	—	
Mochis	10	34	—	1	—	1	—	2·9	—	100·0	—	2·9	—	
Musalmans	6	622	—	35	—	27	—	5·6	—	77·1	—	4·3	—	
Pancholis	44	76	6	21	5	16	13·8	27·6	83·3	76·1	11·3	21·0	46·0	6
Parsees	9	843	—	15	—	11	—	1·7	—	73·3	—	1·3	—	Not known.
Sonis	26	86	1	8	1	7	3·8	9·3	100·0	87·5	3·8	8·1	52·6	5
Sutars	47	201	6	14	1	13	12·8	6·9	16·6	92·5	2·1	6·4	67·0	6
Total	432	5,145	26	228	16	187	6·01	4·4	61·6	82·0	3·7	3·6	—	38

(3.) The conclusions that can be drawn are the same as shown in my précis of evidence, with only this difference that—

(*a.*) The per-centage of attacks in inoculated was less than amongst the others in only four communities (and not in six), viz., Dublas, Ghanchis, Pancholis, and Sonis, and more in four (instead of two) viz., Golas, Kumbhars, Kolis, and Sutars.

(*b.*) That in all communities except the Kumbhars, cases had occurred amongst the uninoculated after introduction of inoculation, and before the first attacks in the inoculated.

(*c.*) And that in all the communities except the Kumbhars there was reduction in mortality to a greater or less degree amongst the inoculated as compared with the uninoculated.

(4.) In Appendix A1 will be found the number of inoculations performed per week from 5th April 1898.

(5.) The monthly gross mortality from all other causes is given in Appendix A2.

(6.) It would be seen therefrom that the difference between the two classes is very great on the whole (18·5 against 32·9), but it is so, because many deaths have ocurred amongst the uninoculated in children under 2 and old men over 60. If the numbers of those two heads be deducted, the death-rate per mille in both would be just equal.

(7.) Clinical aspect of inoculated cases. Twenty-four bubonic, 2 pneumonic. One of the 24 bubonic was complicated latterly by pneumonia.

II.—UNDHERA.

(8.) The census was taken on 5th January 1898. On that day the population consisted of 1,031 souls. From that day to 12th February 1898, 76 persons had died, and 10 had left the village, and five were born, thus leaving 950 persons alive on the latter day.

(9.) In Appendix B will be found the number of cases and deaths per castes from the date of the first appearance of plague.

(10.) Appendix C shows the gross mortality from all other causes in strong and sickly persons in inoculated and uninoculated from 12th February 1898 to 15th February 1899.

(11.) The results are slightly in favour of the inoculated (21·4 against 25·1).

(12.) It must be mentioned here that seven more deaths had actually occurred at Undhera during the period above mentioned, but they have not been included in the table, because five of them were in children born after 12th February 1898, and two in persons who returned to the village probably after the disappearance of the plague. Of the five children three were still-births and two of eight months. Of the two who returned after the disappearance of plague, one was a child of 1 year and the other an old man of 55.

(13.) The information given in Appendix C was asked for by Prof. Haffkine in his letter No. 1,376, dated 7th inst, and it was obtained by a house-to-house visitation at Undhera in company with the Vahivatdar of Baroda and the late Assistant Plague Commissioner of the Baroda district.

(14.) The numbers of inoculated per ages will also be found in Appendix C.

(15.) Clinical aspect of the inoculated cases. Only one is reported to have died of pneumonia. The rest were bubonic, as found out on inquiry of the Patel.

III.—DHAMDACHHA.

(16.) The gross mortality from all causes other than plague in inoculated and uninoculated is shown in Appendix D.

(17.) The results seem to be much in favour of the inoculated, but I believe they are only apparently so for if comparison be made as to the results of mortality in persons from 16 to 40 years of age (representing the age of the largest number of the inoculated) the difference is very little in favour.

(18.) The reasons why the results appear so favourable are (1) the probable concealment of plague cases and their consequent return under mortality from other causes, (2) the fact that most of the inoculated were healthy persons between 20 and 45, and (3) the occurrence of many deaths in children and old men amongst the uninoculated.

(19.) The mortality from plague amongst the inoculated and uninoculated in the different castes after inoculation is shown below:—

Castes.	Attacks.	Deaths.
Kumbhars	5	4
Anavlas	1	1
Kachhias	2	2
Musalmans	11	5
Darzis	1	1
Total	20	13

(20.) Though in Appendix H of the précis of evidence there appear 15 deaths from plague from the week ending 17th April to the close of the epidemic, the difference of 2 is explained by their occurrence on 11th and 12th April 1898 (viz., before inoculation).

IV.—Bajwa.

(21.) The gross mortality from causes other than plague in inoculated and uninoculated persons after the introduction of inoculation is given in Appendix E.

(22.) From it it will be noticed that there was no death amongst the inoculated, probably because most of them were healthy persons between 20 and 45 years of age.

(23.) Clinical aspect of cases in inoculated—4 bubonic; rest not known.

V.—Gandevi.

(24.) Appendix F shows the gross mortality from causes other than plague in inoculated and uninoculated persons from the first date of inoculation.

(25.) From it it will be seen that there is a great difference in favour of the inoculated on the whole. It could, however, be explained away by the fact that most of the deaths occurred in children under 2 and old men over 60. If these be deducted as they should be on account of there being very few inoculated persons of those ages, there would be very little difference left in the results.

VI.—Koili.

(26.) The table of gross mortality from all other causes could not be prepared as all information was not properly available.

(27.) Clinical aspect of the cases in the inoculated—6 of the 13 cases were bubonic. Information as to the rest is not available from the investigation sheets submitted to the Chief Medical Officer's Office.

VII.—Sakarda.

(28.) Population according to the census of 1891:—

Under 5 years	282
From 6 to 60 years	1,616
Over 60 years	31
Total	1,929

(29.) Gross mortality from all causes for three months previous to 14th February 1898 (date of first case):—

(30.) These figures are not available as the death register was accidentally burnt up in a conflagration.

(31.) Gross mortality from plague and from all other causes per week from 14.2.98 (date of first case) is given in the following table:—

Week ending.	Plague.			All other Causes.		
	Up to 5.	6 to 60.	Over 60.	Up to 5.	6 to 60.	Over 60.
21st Feb. 1898	—	1	—	—	—	—
1st March "	1	9	—	—	—	—
8th " "	2	5	—	—	—	—
15th " "	—	3	1	—	—	—
22nd " "	—	2	1	—	—	—
29th " "	—	7	—	—	—	—
5th April "	—	13	—	—	—	—
12th " "	1	9	—	—	—	—
19th " "	—	11	—	—	—	—
26th " "	2	1	—	—	—	—
3rd May "	—	5	—	—	—	—
Total	6	66	2	—	—	—
Grand total			74			

(32.) Gross mortality from plague and from all other causes per month from date of first case, second epidemic.

Month ending	Plague.			All other Causes.		
	Up to 5.	6 to 60.	Over 60.	Up to 5.	6 to 60.	Over 60.
31st August 1898	1	6	—	—	7	—
30th Sept. "	1	1	—	—	2	—
31st October "	1	1	—	—	2	—
30th Nov. "	—	—	—	—	—	—
31st Dec. "	—	3	—	—	3	—
Total	3	11	—	—	14	—
Grand total all causes			28			

(33.) The figures given above show that the disease was quiescent for three months.

(34.) Inoculation was begun on 17.4.98, and since that date to 31.12.98 24 deaths occurred from plague in the uninoculated, none having occurred amongst the others.

(35.) Gross mortality from all other causes in inoculated and uninoculated cannot be obtained, as the death register for the past year was burnt. From August to December 1898 14 deaths occurred in all, out of which one only (from jaundice) occurred amongst the inoculated.

(36.) In all 140 persons were operated upon.

(37.) All this information was supplied to me by Dr. S. M. Dave who was specially deputed for the purpose.

VIII.—Kantharia.

(38.) Population according to the census of 1891:—

Under 5 years	71
From 6 to 60 "	281
Over 60 "	12
Total	364

(39.) Gross mortality for three months previous to first case (29.1.98):—

From 29.10.97 to 28.11.97	2
" 29.11.97 " 28.12.97	0
" 29.12.97 " 28.1.98	1
Total	3

(40.) Gross mortality from plague per week from 29.1.98 (date of first case).

Week ending	Plague. Up to 5.	6 to 60.	Over 60.
7th February 1898	—	1	—
14th " "	—	2	—
21st " "	1	12	—
28th " "	—	4	—
7th March "	—	1	—
14th " "	—	1	—
Total	1	21	—
Grand total - 22			

(41.) No death occurred from other causes during the above period.

(42.) Inoculation was begun on 24.2.98. Most operations were performed by myself within three days (in all 99), the rest having been performed later by a Hospital Assistant. There was a distinct fall in the mortality in the same week.

(43.) Gross mortality from plague in inoculated and uninoculated after the introduction of inoculation.

Week ending	Inoculated. Up to 5.	6 to 60.	Over 60.	Uninoculated. Up to 5.	6 to 60.	Over 60.
2nd March 1898	—	1	—	—	3	—
9th " "	—	1	—	—	—	—
16th " "	—	—	—	—	1	—
Total	—	2	—	—	4	—
Grand total - - - - 6						

(44.) No death occurred amongst the inoculated from other causes. Information about deaths in uninoculated has not been supplied to me.

(45.) In all 110 operations were performed, and not 223 as mentioned before.

(46.) Synopsis of investigation-sheets.

Houses.	Persons Inoculated.	Persons not Inoculated.	Attacks. Inoculated.	Attacks. Uninoculated.	Deaths. Inoculated.	Deaths. Uninoculated.	Per-centage of Attacks. Inoculated.	Per-centage of Attacks. Uninoculated.	Per-centage of Deaths. Inoculated.	Per-centage of Deaths. Uninoculated.
3	4	14	2	4	2	4	25	28·4	25	28·4

(47.) Out of the two houses in which inoculated persons died, in one, four persons had died of plague within the previous seven days, and in the other one person died after the death of the inoculated. Whether there were any deaths before in the second house above mentioned is not known.

Clinical aspect of the inoculated cases—

(48.) One died of pneumonia on fourth day after inoculation. Information is not available as to the second. He died within four days of the inoculation.

(49.) All this information was supplied by Dr. S. M. Dave who had been specially deputed for the purpose.

IX.—Jarod.

(50.) Clinical aspect of the two cases amongst the inoculated—Both were pneumonic and both died on the sixth day after inoculation.

(51.) Gross mortality from causes other than plague in inoculated and uninoculated after the introduction of inoculation is not available.

X.—Savali.

(52.) Gross mortality from causes other than plague in inoculated and uninoculated after the introduction of inoculation is not taken out, because the number of inoculated was very small.

(53.) Clinical aspect of inoculated cases—
Three were bubonic and one was pneumonic as reported by the Hospital Assistant Savali in his letter No. 277, dated 1st March 1899.

XI.—Other Villages of the Baroda District.

(54.) Information about the gross mortality from causes other than plague in inoculated and uninoculated after the introduction of inoculation is not available.

XII.—Gadat.

(55.) Gross mortality from causes other than plague in inoculated and uninoculated after the introduction of inoculation is given in Appendix G.

(56.) From it, it will be seen that the mortality in both classes is remarkably low, and that on the whole the results are very much in favour of the inoculated, but the difference would not be so great if the deaths in children under 2 and old men over 60 be excluded. It is remarkable, however, that the only deaths that occurred amongst the inoculated was in an old person over 55.

XIII.—Manekpur.

(57.) Gross mortality from causes other than plague after the introduction of inoculation is given in Appendix H.

(58.) From it, it will appear that no death has occurred amongst the inoculated. There is nothing remarkable in that however, since there ought to be none in their very small number (29 only) at the rate of mortality amongst the others.

XIV.—Valoti.

(59.) Gross mortality from causes other than plague in inoculated and uninoculated after inoculation is shown in Appendix I.

(60.) It will be noticed therefrom that on the whole the difference between the two classes is very small, and that the results are slightly favourable amongst the inoculated. If the deaths in children under 2 be not taken into consideration the results would be found equal.

XV.—Ajrai.

(61.) Gross mortality from all other causes in inoculated and uninoculated after the introduction of inoculation will be found in Appendix J.

(62.) From the same it will be seen that at first sight the results are very favourable in the inoculated, but if deaths in children under 2, and old men over 60, are left out of consideration, the balance of favour would be found going over to the uninoculated.

XVI.—Dhanuri.

(63.) Gross mortality from all other causes in inoculated and uninoculated after the introduction of inoculation will be found embodied in Appendix K.

(64.) Here too, the results appear favourable on the whole amongst the inoculated, but if death in children under 2 and old men over 60 be omitted, the results would be found equal.

XVII.—Sonvadi.

(65.) Information about gross mortality after inoculation is not available.

XVIII.—Naosari.

(66.) As the number of inoculated was very small, and as there was no indigenous case of plague there, information about gross mortality has not been collected.

XIX.—Kholvada.

(67.) Gross mortality from all causes other than plague in inoculated and uninoculated from the first date of inoculation is given in Appendix L.

(68.) It will be seen therefrom that no death occurred amongst the inoculated there, the probable reason being that most of the inoculated were fine healthy persons between 20 and 45 years of age.

XX.—Metrina.

(69.) Appendix M give the gross mortality from all other causes after the introduction of inoculation.

(70.) Here, too, no death has occurred amongst the inoculated because the number operated on was very small.

XXI.—Pachakwada.

(71.) In Appendix N will be found the required information as to the gross mortality amongst the people after the introduction of inoculation.

(72.) No death will be found to have occurred amongst the inoculated, probably because most of them were fine healthy people between 6 and 45. According to the rates of deaths in uninoculated people between 6 and 45 there should be no death amongst them.

XXII.—Methan.

(73.) Information as to gross mortality after inoculation is given in Appendix O.

(74.) No death has occurred amongst the inoculated. None should have occurred since the mortality in uninoculated persons of the same categories of age as the inoculated is remarkably low also.

XXIII.—Dindrol.

(75.) Information as to the gross mortality after inoculation is not available.

XXIV.—Bhilwan.

(76.) Gross mortality from all causes other than plague after the introduction of inoculation is given in Appendix P.

(77.) No death has occurred amongst the 55 inoculated persons, because most of them were healthy persons between 20 and 45. According to the rates of deaths in the uninoculated, in the same categories of age as cover the inoculated persons, there should have been no death in them.

XXV.—Sidhpur.

(78.) Appendix Q shows the gross mortality from all other causes after the introduction of inoculation.

(79.) Here, too, no death has occurred amongst the inoculated, probably because most of them were healthy persons between 20 and 45.

XXVI.—Vaghdod.

(80.) As there was only one person inoculated (instead of 15 as mentioned in Appendix S of the précis of evidence, 14 having come from Bhilwan to get themselves inoculated), information as to the gross mortality is not collected.

XXVII.—The Baroda State.

(81.) Appendix R gives the general results showing effect of inoculation on plague in the whole State.

(82.) It appears therefrom that inoculation lessens the number of attacks as well as the case mortality.

(83.) In 11 out of the 18 places included in the list no inoculated person was attacked, though more or less cases continued to occur amongst the uninoculated.

(84.) Out of the seven places in which attacks did occur amongst the inoculated very good results were obtained at Undhera, Koili, and Bajwa. At Billimora and Kantharia, though the results do not appear favourable at first sight on the whole, the effect is palpably good as will be seen on a reference to the details given in the first report and in this one. No opinion can be hazarded about Savli and Jarod because the details about those places have not been gathered. The results of these seven places are added together in Appendix S.

(85.) It may be interesting to note here that most cases have occurred amongst the inoculated at Kantharia, Jarod, and Savli in those houses in which deaths had occurred amongst the uninoculated within the previous 10 days.

(86.) Effect of inoculation on the general mortality (from all causes other than plague) is shown in Appendix T.

(87.) It will be seen therefrom that the results are apparently very much in favour of the inoculated on the whole (9·3 against 20·6 per mile). But when deaths in children under two, and in old men over 60 are deducted (for there were very few inoculated of those ages) the difference in death-rate is much less (9·3 against 12·4). Here too, however, a decent margin is left in favour of the inoculated.

(88.) Statement of all the places as to how many inoculated people left the town and how many came back in each district cannot be prepared, as no record was kept of the same.

(89.) About the Naosari district (which includes Billimora and Dhamdachha) the Vahivatdar informs me that passes were issued to the inoculated to enable them to move about the villages for ordinary work; that they were permitted to go to other villages for business, but they were not allowed to stay there longer than three or four days, and that it is certain that they were not allowed to leave their own residence for good and to stay in other villages, since there was always borne in mind the danger of their clothes, personal effects, &c., carrying infection thither.

(90.) In Baroda and Kadi districts even stricter watch seems to have been kept, since even the inoculated were not allowed to enter other villages.

(91.) From these facts it may be gathered that virtually all inoculated persons stayed at their own towns, and were thus exposed to infection quite as much as their uninoculated relatives.

Does Inoculation increase Plague amongst the Uninoculated?

(92.) It has been alleged by certain persons that inoculation increases the spread of plague in the uninoculated. With a view to find out if this be true or otherwise, I have prepared tables showing the virulence of the disease in inoculated and non-inoculated villages, in the different districts of the State. Appendix U. gives the necessary information about the Baroda district, Appendix V. about the Naosari and Amreli districts, and Appendix W. about the Kadi district.

(93.) Taking Appendix U first, we find that amongst the inoculated villages the mortality (as calculated upon the highest number of deaths in one week) per mille per annum—

(*a.*) At Ratanpur had reached the phenomenal figure of 2,328, but it will be seen that this occurred before inoculation was ever begun. In fact, plague had disappeared at the time of the beginning of the operations there, so virtually this village should be counted as an uninoculated one. This instance shows that plague mortality could reach very high by itself irrespective of any influence of inoculation on it;

(*b.*) At Kantharia the highest mortality was at the rate of 1,857 per mille, but this was the case before inoculation was begun, only six cases and deaths having occurred after inoculation. On a reference to paras. 40 and 42 of this report, it will be found that there was a

distinct fall in the mortality in the same week in which inoculations were begun. The first case of plague in inoculated occurred moreover on 26.2.98, and though the same died of pneumonia on 28.2.98, there occurred no rise in the mortality. This instance too, therefore goes against the question above given ;

(*c.*) At Undhera again the mortality was highest in the same week in which the operations were begun, but they were done in the latter half of the week, and numbered only 35 by the end of the same period. Most operations (466) were performed on 12.2.98 (viz., nearly a fortnight after the week of the highest mortality). Besides, the first attack amongst the inoculated happened on 21.2.98. The plague mortality moreover in the week previous to the one of the greatest mortality and of the beginning of inoculations was 756 per mille. All these facts show that the epidemic itself was very virulent irrespective of any effect of the inoculations on it ;

(*d.*) At Bajwa the highest mortality was in the week ending 5.3,93, viz., about a fortnight after the inoculations were begun and finished. Here at first sight, it appears that there might be some truth in the allegation of the opponents of inoculation. But when the facts that the first case amongst the inoculated occurred on 4.3.98 (viz., only a day previous to the close of the week), and that in other uninoculated villages of the same district the mortality has been as high or even higher than at this place, it may not be considered unreasonable to advance the view that the mortality was so high most probably on account of the naturally greater virulence of the poison alone ;

(*e.*) At Koili, too, the highest mortality occurred about a month after the beginning of the inoculations, but that was, in all probability, in the natural course of the epidemic, for though two cases occurred in first week (*vide* Appendix J of the précis of my evidence), there was no death for full four weeks afterwards. The highest mortality again has been only 391 per mille, a figure which has been exceeded in five of the sixteen uninoculated villages of the same district. The first case amongst the inoculated occurred on 14.3.98. The largest number of inoculations (viz., over 700) were performed on 5.4.98, and there has been a marked and steady fall in mortality since that date. So it would be safe to infer that inoculations had no effect towards raising the mortality amongst the uninoculated;

(*f*) At Sakarda, Jarod, Karodya, and Chhani, the highest mortality has been before the beginning of the inoculations, and the highest figures too are not at all high, so inoculation cannot be said to have been harmful in the way alleged. The two attacks and deaths in inoculated at Jarod occurred on 16.4.98 (viz., nearly a month after the week of the highest mortality) ;

(*g.*) At Baroda and Savli the highest mortality has occurred after the beginning of the inoculations, but here too the highest figures reached have been only 261 and 77 respectively. At Savli again, the number of the inoculated was too small (as compared to the total population) to have any appreciably bad effect. The first case amongst the inoculated at Savli occurred on 28.8.98 ;

(*h.*) Taking the 16 uninoculated villages, the rate of mortality has been very high in three and moderately so in three more ;

(*i.*) Considering the two groups of villages from the point of view of the destruction of the total population, the first place should be assigned to Ratanpur ($\frac{1}{6}$th), which, though put down in the list of inoculated villages, should be virtually considered an uninoculated one for reasons given above. Undhera, an inoculated place, comes next with $\frac{1}{8}$th, closely followed by Sandhasal, an uninoculated one, with $\frac{1}{10}$th. Bajwa and Kantharia, both inoculated, follow with a loss of $\frac{1}{16}$th each, and Javla, a non-inoculated one, is close in their wake with $\frac{1}{17}$th part lost.

(94.) Taking Appendix V, it would be seen—

(*a.*) That amongst the inoculated villages Billimora and Dhamdachha were the only places where plague was prevalent at the time of and after inoculation, all the others having been taken in hand after all signs of the disease had completely disappeared. These latter villages therefore (viz., Gadat, Manekpur, Ajrai, Gandevi, Valoti and Dhanuri) may be virtually considered as uninoculated ;

(*b.*) That at Billimora the highest mortality occurred after the beginning of inoculation, because the epidemic was also just begun when the operations were taken in hand. On comparing the highest plague mortality of the first epidemic with that of the second, it certainly appears greater, and that would seemingly give colour to to the allegation above given, but that is so, because in the first epidemic many cases went undetected. If the total mortality is taken into consideration, very little difference will be found, for it was 18 for two consecutive weeks in May 1887 (*vide* Appendix A of my précis of evidence), and 19 in second week of October 1898 (*vide* Appendix B of the précis of my evidence). Besides, the highest rate attained per mille was small. It would therefore be only proper to infer that inoculation had no influence as regards increasing plague mortality in the uninoculated at this place ;

(*c.*) That at Dhamdachha the highest mortality of second epidemic was before the beginning of the inoculations. Plague declined soon after the performance of the operations. The highest rate reached was only 120 per mille, so it may be safely said that there was no ill-effect of inoculation as said above ;

(*d.*) That at Kosmada, too, the greatest mortality was higher than in most of the inoculated villages, especially Billimora and Dhamdachha, thus indicating the fact that plague mortality rises high only in accordance with the virulence of the poison ;

(*e.*) That at Bet the mortality does not seem to have risen high at all.

(95.) From Appendix W it will be seen—

(*a.*) That the highest mortality occurred in all the inoculated villages, except Kholvada, before the beginning of the operations, so that virtually they may be considered to be uninoculated ;

(*b.*) That at Kholwada it was highest in the week in which inoculations were performed at the tail-end ;

(*c.*) That though the poison was present in all the villages, in none did the mortality increase after inoculation (*vide* Appendix S of the précis of my evidence) ;

(*d.*) That the mortality was very high in only three inoculated villages ;

(*e.*) That no case occurred amongst the inoculated in all the inoculated villages ;

(*f.*) That the mortality was very high in 7 out of the 12 uninoculated places ;

(*g.*) And that therefore inoculation has not increased plague mortality amongst the uninoculated in inoculated villages, but that the mortality is high or low according to the virulence of the poison only.

(96.) On the whole, therefore, the question given at the top should certainly be answered in the negative.

DHANJIBHAI H. MEHTA,
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Baroda.

APPENDIX A 1.

BILLIMORA.

INOCULATIONS and CASES per Week from INTRODUCTION of OPERATIONS.

Week ending	Number of Inoculations.	Number of Plague Cases.	Week ending	Number of Inoculations.	Number of Plague Cases.
9th April 1898	8	1	16th July 1898	—	6
16th „ „	—	—	23rd „ „	11	10
23rd „ „	114	1	30th „ „	76	7
30th „ „	37	1	6th August 1898	—	12
7th May „	29	—	13th „ „	4	15
14th „ „	—	—	20th „ „	—	14
21st „ „	38	10	27th „ „	1	12
28th „ „	56	7	3rd September 1898	—	10
4th June „	27	—	10th „ „	2	13
11th „ „	6	2	17th „ „	1	13
18th „ „	12	1	24th „ „	1	6
25th „ „	2	6			
2nd July „	7	5	Total	432	156
9th „ „	—	4			

APPENDIX A 2.

BILLIMORA.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS after the INTRODUCTION of INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 40.
5.4.98—4.5.98	—	—	—	—	—	—	—	—	—	—	—	1	5	2	—	—	—	3
5.5.98—4.6.98	—	—	—	—	—	—	—	—	—	6	1	6	—	—	—	—	1	3
5.6.98—4.7.98	—	—	—	—	1	—	—	—	—	1	2	5	—	1	—	3	—	7
5.7.98—4.8.98	—	—	—	1	1	—	—	—	—	4	4	5	2	—	—	2	1	2
5.8.98—4.9.98	—	—	—	1	—	—	—	—	—	3	4	4	—	—	—	1	—	4
5.9.98—4.10.98	—	—	—	—	—	—	—	—	—	6	1	5	1	—	1	—	—	4
5.10.98—4.11.98	—	—	1	1	—	—	—	—	—	3	—	2	1	—	—	1	1	3
5.11.98—4.12.98	—	—	—	—	—	—	—	—	—	3	—	4	—	—	1	1	1	2
5.12.98—4.1.99	—	—	—	—	1	—	—	—	—	4	2	6	1	1	1	—	—	4
5.1.99—10.2.99	—	—	—	1	—	—	—	—	—	4	2	2	1	—	2	1	2	5
Total	—	—	1	4	3	—	—	—	—	34	16	40	11	4	5	9	6	37
Number of persons	2	14	259	71	28	23	20	11	4	191	508	2,549	717	221	290	116	163	163
Death-rate per mille	—	—	3·8	56	107	—	—	—	—	178	31	15	15	18	17	77	36	227

N.B.—Though, on a comparison of the whole, the difference in mortality amongst the two classes appears very great (18·5 against 32·9), it is because many deaths occurred amongst the uninoculated in children under 2 and old men over 60. If these be deducted as they should be, because there are very few inoculated of those ages, the death-rate in both would be equal.

If the three cycles of age in which deaths in inoculated persons have occurred be alone considered, the rate per mille would be 22·2 (a very fair rate for the town).

APPENDIX B.

UNDHERA.

CASES and DEATHS per DIFFERENT CASTES.

From 22.12.97 to 12.2.98.

Castes.	Number of Cases.	Number of Deaths.
Pattidars	42	37
Pagees	3	3
Barias	27	24
Brahmans	8	5
Ravals	2	2
Bhangis	9	7
Kumbhars	4	4
Sutars	1	1
Veragis	1	1
Dhers	2	2
Khalpas	2	1
Total	101	87

From 13.2.98 to 26.3.98.

Cases.	Number of Cases.	Number of Deaths.
Pattidars	11	8
Hajjams	1	—
Barias	14	14
Brahmans	—	1
Kolis	5	4
Bhangis	2	3
Sutars	1	1
Veragis	1	1
Dhers	4	4
Khalpas	1	1
Total	40	37
Grand total	141	124

N.B.—Four Barias and one Koli were attacked in the suburb after 12.2.98. All died.
Three persons had been attacked before 12.2.98, but died after that date.
These figures were obtained from the Patel and Talati of the village.

APPENDIX C.

UNDHERA.

MORTALITY from GENERAL CAUSES in INOCULATED and UNINOCULATED PERSONS from 12.2.98 to 15.2.99.

Periods of age.	Inoculated.				Uninoculated.			
	In strong.		In sickly.		In strong.		In sickly.	
	No. of strong persons.	No. of deaths in them.	No. of sickly persons.	No. of deaths in them.	No. of strong persons.	No. of deaths in them.	No. of sickly persons.	No. of deaths in them.
Below 1 year	4	—	2	—	10	3	1	1
1 year and over, but under 2	14	2	1	—	18	3	—	—
2 to 4 years	42	4	—	—	47	2	1	—
5 to 9 years	56	1	5	—	48	—	1	—
10 to 19 years	91	—	—	—	58	—	1	—
20 to 39 „	188	1	4	—	154	—	2	—
40 to 54 „	59	1	11	2	61	—	4	—
55 to 64 „	15	—	14	—	16	1	11	1
65 upwards	2	—	5	—	3	—	1	—
Total	471	9	42	2	415	9	22	2

N.B.—The population of Undhera consisted of 950 souls on 12.2.98, the date on which most inoculations were performed, though, according to the census taken on 5th January 1898, it was 1,031.

Seven more deaths had actually occurred, but they have not been taken in the table because five of them were in children born after 12.2.98, and two in persons who returned to the village probably after the disappearance of the plague.

APPENDIX D.

DHAMDACHHA.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS after the INTRODUCTION of INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.
13.4.98 to 12.5.98	—	—	—	—	—	—	—	—	—	—	—	7	1	—	1	—	3	3
13.5.98 to 12.6.98	—	—	—	—	—	—	—	—	—	3	—	4	1	—	—	1	2	
13.6.98 to 12.7.98	—	—	—	—	—	—	—	—	—	1	—	8	—	1	—	—	—	—
13.7.98 to 12.8.98	—	—	—	1	—	—	—	—	—	4	1	3	—	—	3	2	—	—
13.8.98 to 12.9.98	—	—	1	—	—	—	—	—	—	—	—	3	—	1	—	—	—	3
13.9.98 to 12.10.98	—	—	—	—	—	—	—	—	—	2	—	3	1	—	—	—	1	—
13.10.98 to 12.11.98	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	1	1
13.11.98 to 12.12.98	—	—	—	—	—	—	—	—	—	—	1	1	1	—	—	—	1	1
13.12.98 to 12.1.99	—	—	—	—	—	—	—	—	—	—	1	1	1	—	—	—	1	1
13.1.99 to 10.2.99	—	—	1	1	—	—	—	—	—	3	—	2	—	2	—	—	1	2
Total	—	—	2	2	—	—	—	—	—	14	3	33	5	4	4	3	10	16
Number of persons	1	4	133	50	15		16	3	3	222	164	672	390	277	217	197	115	181
Death-rate per mille	—	—	15	40	—	—	—	—	—	63	12	49	12·9	14	18	15	87	88

N.B.—Though on the whole the difference in mortality amongst the two classes appears very great (16·6 against 37·9), when comparison is made in numbers most inoculated according to age, the difference is not so great. One reason of the difference on the whole is the probable concealment of plague cases and the consequent return of their deaths, under the head of general causes.

APPENDIX E.

BAJWA.

GROSS MORTALITY from CAUSES other than PLAGUE from the INTRODUCTION of INOCULATION.

Months.	Uninoculated.									Remarks.
	Under 2 years.	2–5.	6–30.	31–40.	41–45.	46–50.	51–55.	56–60.	Over 60.	
18.2.98—17.3.98 -	—	1	—	—	—	—	—	—	—	There was no death amongst the inoculated, probably because most were healthy persons between 20 and 45.
18.3.98—17.4.98 -	—	—	—	—	—	—	—	—	—	
18.4.98—17.5.98 -	—	—	—	—	—	—	—	—	—	
18.5.98—17.6.98 -	—	—	—	—	—	—	—	—	—	
18.6.98—17.7.98 -	—	—	1	—	—	—	—	—	—	
18.7.98—17.8.98 -	—	—	—	1	—	—	—	—	—	
18.8.98—17.9.98 -	—	—	—	1	—	—	—	—	—	
18.9.98—17.10.98 -	—	—	—	—	—	—	—	—	—	
18.10.98—17.11.98 -	1	—	—	—	—	—	—	—	—	
18.11.98—17.12.98 -	—	1	—	—	—	—	—	—	—	
8.12.98—17.1.99 -	—	—	—	—	—	—	—	—	—	
18.1.99—10.2.99 -	1	1	3	—	—	—	—	—	—	
Total - -	2	3	4	2	—	—	—	—	—	
Number of persons uninoculated.	25	63	190	92	15	12	25	7	24	
Death-rate per mille -	80	47·6	21	21·7	—	—	—	—	—	
Number of inoculated persons.	2	15	81	31	9	2	6	8	2	

APPENDIX F.

GANDEVI.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS from the FIRST DATE of INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.
19.4.98—18.5.98 - -	—	—	—	—	—	—	—	—	—	3	—	4	1	—	—	—	—	1
19.5.98—18.6.98 - -	—	—	—	—	—	—	—	—	—	5	1	3	1	—	2	—	—	1
19.6.98—18.7.98 - -	—	—	—	—	—	—	—	—	—	2	1	3	2	—	—	—	—	1
19.7.98—18.8.98 - -	—	—	1	—	—	—	—	1	—	5	3	5	—	—	—	—	2	5
19.8.98—18.9.98 - -	—	—	—	—	—	—	—	—	—	4	1	1	—	—	1	1	—	1
19.9.98—18.10.98 - -	—	—	—	—	—	—	—	—	—	2	2	1	1	—	—	—	—	1
19.10.98—18.11.98 - -	—	—	—	—	—	—	—	—	—	3	1	3	—	—	1	—	—	7
19.11.98—18.12.98 - -	—	—	—	1	—	—	—	—	—	2	—	—	1	—	—	—	3	2
19.12.98—18.1.99 - -	—	—	1	—	—	—	—	—	—	7	1	6	2	—	—	—	2	8
19.1.99—10.2.99 - -	—	—	—	—	—	—	—	—	—	4	1	4	—	—	—	—	2	3
Total - -	—	—	2	1	—	—	—	1	—	37	11	30	8	—	4	1	9	30
Number of persons -	1	3	255	89	29	22	8	11	3	536	351	2,336	2,196	909	319	277	202	369
Death-rate per mille -	—	—	7·8	11·2	—	—	—	90·9	—	69	31	12·8	3·6	—	12·5	3·6	44·6	81·3

N.B.—Though on the whole the difference in mortality between the two classes appears great (9·5 against 17·3), it was on account of the fact that most of the inoculated were fine healthy persons between 20 and 45, and that many deaths occurred in children under two and old men over 60.

APPENDIX G.

GADAT.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS from the FIRST DATE of INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.
14.4.98—13.5.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14.5.98—13.6.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14.6.98—13.7.98	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
14.7.98—13.8.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
14.8.98—13.9.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14.9.98—13.10.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
14.10.98—13.11.98	—	—	1	—	—	—	—	—	—	1	2	1	—	—	—	—	—	—
14.11.98—13.12.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14.12.98—13.1.99	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—
14.1.99—10.2.99	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
Total	—	1	—	—	—	—	—	1	—	2	4	1	—	—	—	—	—	2
Number of persons	—	18	134	41	24	14	15	5	1	76	104	380	96	32	43	42	38	67
Death-rate per mille	—	—	—	—	—	—	—	200	—	26·3	38·4	2·7	—	—	—	—	—	29·8

N.B.—Though the difference in mortality in the two classes is great (3·9 against 10·3), it is due mainly to the inoculated persons being strong people from 20 to 45 years of age.

Though the population according to the census of 1891 was 990, it numbered 1,118 souls when a special census was taken at the commencement of the plague.

APPENDIX H.

MANEKPUR.

GROSS MORTALITY from CAUSES other than PLAGUE from the INTRODUCTION OF INOCULATION.

Months.	Uninoculated.									Remarks.
	Under 2 years.	2–5.	6–30.	31–40.	41–45.	46–50.	51–55.	56–60.	Over 60.	
28.4.98—27.5.98	—	—	—	—	—	—	—	—	—	There was no death amongst the inoculated, because at the rate of 17 in 590, there would be less than 1 in 29 inoculated persons.
28.5.98—27.6.98	—	—	—	—	—	—	—	—		
28.6.98—27.7.98	—	—	—	—	—	—	—	—	1	
28.7.98—27.8.98	1	—	—	—	—	—	—	—	1	
28.8.98—27.9.98	1	—	—	—	—	—	—	—	1	
28.9.98—27.10.98	2	—	—	—	—	—	—	—	—	
28.10.98—27.11.98	1	—	1	—	—	—	—	—	—	
28.11.98—27.12.98	1	1	1	1	—	—	1	—	—	
28.12.98—27.1.99	2	1	—	—	—	—	—	—	—	
28.1.99—10.2.99	—	—	—	—	—	—	—	—	—	
Total	8	2	2	1	—	—	1	—	3	
No. of persons uninoculated.	56	70	267	64	26	31	34	14	28	
Death-rate per mille	142·8	28·5	7·4	15·6	—	—	29·4	—	107	
No. of inoculated persons.	—	1	10	10	4	3	1	—	—	

APPENDIX I.

VALOTI.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS from the INTRODUCTION of INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.
15.4.98 to 14.5.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15.5.98 to 14.6.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15.6.98 to 14.7.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15.7.98 to 14.8.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15.8.98 to 14.9.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15.9.98 to 14.10.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
15.10.98 to 14.11.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15.11.98 to 14.12.98	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—
15.12.98 to 14.1.99	—	—	1	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—
15.1.99 to 10.2.99	—	—	—	—	—	—	—	—	—	1	—	1	1	—	—	—	—	—
Total	—	—	1	—	—	—	—	—	—	1	1	3	2	—	1	—	—	—
Number of persons	2	3	51	25	5	4	4*	1	—	43	52	219	155	45	46	56	34	15
Death-rate per mille	—	—	19·7	—	—	—	—	—	—	23·2	19·2	13·6	12·9	—	21·7	—	—	—

N.B.—The difference on the whole between the two classes is very little (10·4 against 12·04). Though the population of Valoti was 746 as per census of 1891, it numbered 760 souls at the beginning of the plague epidemic.

APPENDIX J.

AJRAI.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS from the INTRODUCTION of INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.
27.4.98—26.5.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27.5.98—26.6.98	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
27.6.98—26.7.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
27.7.98—26.8.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
27.8.98—26.9.98	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
27.9.98—26.10.98	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
27.10.98—26.11.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
27.11.98—26.12.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
27.12.98—26.1.99	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1	—	—	—
27.1.99—10.2.99	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—
Total	—	1	—	—	—	—	—	—	—	2	1	1	—	1	1	1	1	3
Number of persons	1	1	47	8	4	3	3	1	1	43	59	216	45	29	23	19	15	18
Death-rate per mille	—	1,000	—	—	—	—	—	—	—	46·4	16·9	4·6	—	34·4	43·4	—	66·6	166·6

N.B.—Though the difference on the whole between the two classes is great (14·4 against 21·4), it is because most of the inoculated were persons between 20 and 45, most deaths having occurred in the uninoculated in children under five and old men over 60.

Though the population numbered 465 according to the census of 1891, 536 people were found when count was taken at the commencement of the plague.

APPENDIX K.

DHANURI.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS from t INTRODUCTION of INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.
17.4.98—16.5.98	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
17.5.98—16.6.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—
17.6.98—16.7.98	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—
17.7.98—16.8.98	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—
17.8.98—16.9.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
17.9.98—16.10.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
11.10.98—16.11.98	—	—	—	—	—	—	—	—	—	2	2	1	—	—	—	—	1	—
7.11.98—16.12.98	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
7.12.98—16. 1.99	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—
17. 1.99—10. 2.99	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	1	—	—	—	—	—	—	4	3	4	1	—	1	—	1	2
Number of persons	—	5	50	19	6	11	5	1	2	82	152	499	109	104	52	30	20	53
Death-rate per mille	—	—	20	—	—	—	—	—	—	48·7	19·7	8	9·1	—	19	—	50	37·7

N.B.—Though the population of Dhanuri was 1,081 according to the census of 1891, it consisted of 1,200 souls when a new census was taken at the beginning of the plague.

Though the difference in mortality in the two classes is not so great as in other places (being 10·1 against 14·5), it was because of the inoculated persons being mostly fine healthy ones between 20 and 45.

APPENDIX L.

KHOLVADA.

GROSS MORTALITY from CAUSES other than PLAGUE from the INTRODUCTION of INOCULATION.

Months.	Uninoculated.									Remarks.
	Under 2 Years.	2–5.	6–30.	31–40.	41–45.	46–50.	51–55.	56–60.	Over 60.	
18.4 98—17.5.98	—	—	—	—	—	—	—	—	—	Though, according to the census of 1891, the population numbered 945, according to the one taken at the beginning of the plague it was only 746, because some people had escaped to other places. There was no death amongst the inoculated, probably because most were healthy young persons from 20 to 45, in which classes the death-rate amongst the uninoculated has aiso been low. At the same rate as amongst the uninoculated there should have been two deaths in them. Though 114 inoculated were mentioned in Appendix S. of the précis of my evidence, only 110 were really operated upon.
18.5.98—17.6.98	—	—	—	—	—	—	—	—	1	
18.6.98—17.7.98	—	—	—	—	—	1	—	—	1	
18.7.98—17.8.98	—	—	—	—	—	—	1	—	—	
18.8.98—17.9.98	—	—	1	—	—	—	—	—	—	
18.9.98—17.10.98	—	—	1	—	—	1	1	—	—	
18.10.98—17.11.98	1	—	—	—	—	—	—	1	—	
18.11.98—17.12.98	—	—	—	—	—	—	—	—	—	
18.12.98—17.1.99	—	1	—	1	—	—	—	—	—	
18.1.99—10.2.99	—	—	—	—	—	—	—	—	—	
Total	1	1	2	1	—	2	2	1	2	
No. of uninoculated	29	86	364	68	30	27	3	24	5	
Death-rate per mille	34	11·6	5·4	14·7	—	74	666	41·6	400	
No. of inoculated persons.	—	—	72	20	6	8	4	—	—	

APPENDIX M.

METRANA.

GROSS MORTALITY from CAUSES other than PLAGUE in INOCULATED and UNINOCULATED PERSONS after the INTRODUCTION OF INOCULATION.

Months.	Inoculated.									Uninoculated.								
	Under 2 years.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.	Under 2.	2 to 5.	6 to 30.	31 to 40.	41 to 45.	46 to 50.	51 to 55.	56 to 60.	Over 60.
23.4.98—22.5.98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
23.5.98—22.6.98	—	—	—	—	—	—	—	—	—	—	—	2	—	1	1	—	—	1
23.6.98—22.7.98	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—
23.7.98—22.8.98	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	1	2
23.8.98—22.9.98	—	—	—	—	—	—	—	—	—	1	—	—	1	1	1	—	—	2
23.9.98—22.10.98	—	—	—	—	—	—	—	—	—	—	3	1	—	—	1	—	—	—
23.10.98—22.11.98	—	—	—	—	—	—	—	—	—	—	—	3	—	—	1	—	—	—
23.11.98—22.12.98	—	—	—	—	—	—	—	—	—	—	—	3	1	—	—	—	—	1
23.12.98—22.1.99	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—
23.1.99—10.2.99	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	1	3	13	4	2	4	—	1	6
Number of persons	—	—	6	—	1	1	—	—	—	30	188	615	124	9	64	3	27	11
Death-rate per mille	—	—	—	—	—	—	—	—	—	33·3	15·9	20·9	32	200·	61·5	—	37·	545·

N.B.—Though the population of Metrana was 1,033 according to the census of 1891, it numbered 1,079 souls when a special census was taken at the commencement of the plague.

The number of inoculated was too small to have any death in them.

APPENDIX N.

PACHAKWADA.

GROSS MORTALITY from CAUSES other than PLAGUE from the INTRODUCTION of INOCULATION.

Months.	Uninoculated.									Remarks.
	Under 2 Years.	2–5.	6–30.	31–40.	41–45.	46–50.	51–55.	56–60.	Over 60.	
21.2.98—20.3.98	1	—	1	—	—	—	—	—	—	Though there were 40 inoculated persons no death has occurred in them, probably because most of them were fine healthy persons of young and middle age. Though the population, according to the census of 1891, was 966, as put down in Appendix S of the précis of my evidence, it numbered 996 souls when census was taken at the commencement of the plague. At the same rate as in the non-inoculated there should have been only one death in the inoculated on the whole.
21.3.98—20.4.98	—	—	—	2	—	1	—	—	—	
21.4.98—20.5.98	—	1	—	—	—	—	—	—	—	
21.5.98—20.6.98	—	2	—	1	—	—	—	—	—	
21.6.98—20.7.98	—	1	1	—	1	—	—	—	—	
21.7.98—20.8.98	—	—	—	—	—	—	—	—	—	
21.8.98—20.9.98	3	1	1	—	—	—	—	—	—	
21.9.98—20.10.98	2	—	1	1	—	—	—	—	—	
21.10.98—22.11.98	—	2	—	—	—	1	—	—	—	
21.11.98—22.12.98	—	1	—	—	—	—	—	—	—	
21.12.98—20.1.99	—	—	—	—	—	—	—	—	—	
21.1.99—10.2.99	—	—	—	—	—	—	—	—	—	
Total	6	8	4	4	1	2	—	—	—	
No. of uninoculated persons.	31	126	483	138	47	38	33	15	15	
Death-rate per mille	193	63·4	8·2	28·9	21·2	52·6	—	—	—	
No. of inoculated persons.	—	2	28	7	3	—	—	—	—	

APPENDIX O.

METHAN.

GROSS MORTALITY from CAUSES other than PLAGUE from the INTRODUCTION of INOCULATION.

Months.	Uninoculated.									Remarks.
	Under 2 years.	2–5.	6–30.	31–40.	41–45.	46–50.	51–55.	56–60.	Over 60.	
25.4.98—24.5.98	—	—	—	—	—	—	—	—	—	There was no death amongst the inoculated because the number was very small, and at the rate of 9 in 1,020, there would be none. Though the population of Methan, according to the census of 1891, was 915, it was 1,063 according to the census taken at the beginning of the plague. The fact that no death occurred amongst the inoculated was found out by comparing the names of each dead person with the names of inoculated persons in the register of inoculations.
25.5.98—24.6.98	1	—	—	—	—	—	—	—	—	
25.6.98—24.7.98	—	—	—	—	—	—	—	—	—	
25.7.98—24.8.98	—	—	—	—	—	—	—	—	—	
25.8.98—24.9.98	1	—	—	—	—	—	—	—	1	
25.9.98—24.10.98	2	—	—	1	—	—	—	—	—	
25.10.98—24.11.98	—	—	—	—	—	—	—	1	1	
25.11.98—24.12.98	—	—	—	—	—	—	—	—	—	
25.12.98—24.1.99	1	—	—	—	—	—	—	—	—	
25.1.99—10.2.99	—	—	—	—	—	—	—	—	—	
Total	5	—	—	1	—	—	—	1	2	
Number of persons uninoculated.	45	153	537	151	36	28	18	25	27	
Death rate per mille	11	—	—	6·6	—	—	—	40	74	
Number of persons inoculated.	—	2	33	6	2	—	—	—	—	

APPENDIX P.

BHILVAN.

GROSS MORTALITY from CAUSES other than PLAGUE after INTRODUCTION of INOCULATION.

Months.	Uninoculated.									Remarks.
	Under 2 years.	2–5.	6–30.	31–40.	41–45.	46–50.	51–55.	56–60.	Over 60.	
11.3.98—10.4.98	3	—	4	—	—	—	—	—	1	Though there were 638 persons according to the census of 1891, in the one taken at the commencement of the epidemic, the number was 684. Though there were only 37 persons put down as inoculated in Appendix S of the précis of my evidence, there were really 55 inoculated, some having gone to Vaghdod for undergoing the operation, and having thus been taken into account at that place. No deaths occurred amongst the inoculated, because most of them were fine healthy fellows between 20 and 45. At the same rate as amongst the uninoculated there should have been only one death in them.
11.4.98—10.5.98	1	—	—	—	—	—	—	—	—	
11.5.98—10.6.98	1	—	—	—	—	—	—	—	—	
11.6.98—10.7.98	1	—	—	—	—	—	—	—	—	
11.7.98—10.8.98	—	—	—	—	—	—	—	—	—	
11.8.98—10.9.98	2	—	—	—	—	—	—	—	—	
11.9.98—10.10.98	1	—	—	—	—	—	—	—	—	
11.10.98—10.11.98	—	—	—	—	—	—	—	—	—	
11.11.98—10.12.98	—	—	—	—	—	—	—	—	1	
11.12.98—10.1.99	—	—	—	—	—	—	—	—	1	
11.1.99—10.2.99	—	1	—	—	—	—	—	—	—	
Total	9	1	4	—	—	—	—	—	3	
No. of uninoculated persons.	40	91	392	72	6	20	3	2	3	
Death-rate per mille	225	10·9	10·2	—	—	—	—	—	1,000	
No. of inoculated persons.	—	—	26	14	7	5	3	—	—	

APPENDIX Q.

SIDHPUR.

GROSS MORTALITY from CAUSES other than PLAGUE from the INTRODUCTION of INOCULATION.

Months.	Uninoculated.									Remarks.
	Under 2 Years.	2–5.	6–30.	31–40.	41–45.	46–50.	51–55.	56–60.	Over 60.	
27.10.98—26.11.98	4	1	10	5	3	2	2	2	9	Though the population according to the census of 1891 was 16,224, only 9,124 persons were in the town when count was taken at the beginning of the plague epidemic, the rest having escaped to the surrounding villages. There was no death amongst the inoculated, probably because most of the persons were fine healthy ones between 20 and 45.
27.11.98—26.12.98	2	2	9	1	—	2	5	1	8	
27.12.98—26.1.99	2	1	7	8	1	4	2	3	3	
27.1.99—10.2.99	3	1	8	1	1	—	—	1	2	
Total - -	11	5	34	15	5	8	9	7	22	
No. of uninoculated persons.	422	788	4,335	1,645	445	702	172	348	172	
Death-rate per mille	26	6·3	7·8	9·1	11·2	11·3	52	2·1	127	
No. of inoculated persons.	—	1	52	22	8	5	3	2	2	

APPENDIX R.

GENERAL RESULTS showing EFFECTS of INOCULATION on PLAGUE in the whole STATE.

Name of City, Town, or Village.	Population.		Attacks.		Deaths.		Attacks per 1,000 of Population.		Deaths per 1,000 of Population.	
	Inoculated	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
Baroda - - -	2,146	110,325	—	1,499	—	1,216	—	13·5	—	11·02
Undhera - - -	513	437	8	27	3	26	15·5	61·7	5·8	59·4
Koili - - -	1,159	2,162	13	123	9	110	11·2	56·8	7·7	50·8
Bajwa - - -	156	453	5	34	4	29	32·05	75·05	25·6	64·1
Billimora - - -	432	4,918	26	228	16	187	60·1	46·3	37·03	38·02
Dhamdachha - -	241	2,435	—	4	—	3	—	1·6	—	1·2
Savali - - - -	16	6,535	4	465	2	316	250	71·1	125	48·3
Jarod - - -	80	2,057	2	24	2	16	25	11·6	25	7·7
Kantharia - - -	110	254	2	4	2	4	18·1	15·7	9	7·8
Chhani - - -	87	3,913	—	125	—	92	—	31·9	—	23·5
Sakarda - - -	140	1,789	—	26	—	24	—	14·5	—	13·4
Kholvada - - -	110	636	—	2	—	—	—	3·1	—	—
Metrana - - -	8	1,071	—	5	—	2	—	4·7	—	1·9
Pachakvada - -	40	956	—	1	—	1	—	1·04	—	1·04
Methan - - -	43	1,020	—	1	—	1	—	0·98	—	0·98
Dindrol - - -	25	994	—	4	—	1	—	4·02	—	1·006
Bhilwan - - -	55	629	—	7	—	3	—	11·1	—	4·7
Sidhpur - - -	95	9,029	—	38	—	38	3	4.2	—	4·2
Total - - -	5,456	149,613	60	2,617	38	2,069	10·9	17·4	6·9	13·1

N.B.—Only those places in which plague was prevalent at the time of inoculation have been included in this table. Thirteen more villages that had no plague-deaths after inoculation have not been included.

From this table it is very evident that inoculation not only lessens the case-mortality, but also lessens the number of attacks very much.

APPENDIX S.

EFFECT of INOCULATION on PLAGUE in those VILLAGES in which ATTACKS in INOCULATED occurred.

Name of Place.	Population.		Attacks.		Deaths.		Attacks per 1,000.		Deaths per 1,000.		Case-mortality per cent.	
	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.	Inoculated.	Uninoculated.
Undhera	513	437	8	27	3	26	15·5	61·7	5·8	59·4	37·5	96·2
Koili	1,159	2,162	13	123	9	110	11·2	56·8	7·7	50·8	69·2	89·4
Bajwa	156	453	5	34	4	29	32·05	75·05	25·6	64·1	80·0	91·1
Billimora	432	4,918	26	228	16	187	60·1	46·3	37·03	38·02	61·5	82·0
Savali	16	6,535	4	465	2	316	250	71·1	125	48·3	50·0	67·9
Jarod	80	2,057	2	24	2	16	25	11·6	25	7·7	100·0	66·6
Kantharia	110	254	2	4	2	4	18·1	15·7	9·0	7·8	100·0	100·0
Total	2,466	16,816	60	905	38	688	24·3	53·8	15·4	40·9	63·3	76·0

N.B.—On the whole the results are very favourable.

APPENDIX T.

EFFECT of INOCULATION on MORTALITY from OTHER CAUSES in the whole STATE.

Name of Town or Village.	Inoculated.																	
	Under 2 Years.		2–5.		6–30.		31–40.		41–45.		46–50.		51–55.		56–60.		Over 60.	
	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.	No. of Persons.	No. of Deaths.
Kholwada	—	—	—	—	72	—	20	—	6	—	8	—	5	—	—	—	—	—
Metrana	—	—	—	—	6	—	—	—	1	—	1	—	—	—	—	—	—	—
Pachakwada	—	—	2	—	28	—	7	—	3	—	—	—	—	—	—	—	—	—
Methan	—	—	2	—	33	—	6	—	2	—	—	—	—	—	—	—	—	—
Bhilvan	—	—	—	—	26	—	14	—	7	—	5	—	3	—	—	—	—	—
Sidhpur	—	—	1	—	52	—	22	—	8	—	5	—	3	—	2	—	2	—
Billimora	2	—	14	—	259	1	71	4	28	3	23	—	20	—	11	—	4	—
Dhamdachha	1	—	4	—	133	2	50	2	15	—	16	—	16	—	3	—	3	—
Gandevi	1	—	3	—	255	2	89	1	29	—	22	—	8	—	11	1	3	—
Gadat	—	—	18	—	134	—	41	—	24	—	14	—	15	—	5	1	1	—
Manekpur	—	—	1	—	10	—	10	—	4	—	3	—	1	—	—	—	—	—
Valoti	2	—	3	—	51	1	25	—	5	—	4	—	4	—	1	—	—	—
Ajrai	1	—	1	1	47	—	8	—	4	—	3	—	3	—	1	—	1	—
Dhanuri	—	—	5	—	50	1	19	—	6	—	11	—	5	—	1	—	2	—
Bajwa	2	—	15	—	81	—	31	—	9	—	2	—	6	—	8	—	2	—
Total	9	—	69	1	1,231	7	418	7	151	3	117	—	83	—	43	2	18	—
Death-rate per mille	—		14·4		5·6		16·9		19·8		—		—		46·5		—	

Grand total of inoculated - - 2,145
" " " deaths - 20
" Death-rate per mille - - 9·3

App. LII.

APPENDIX T.—*continued.*

Name of Town or Village.	Uninoculated. Under 2 Years. No. of Persons.	Under 2 Years. No. of Deaths.	2–5. No. of Persons.	2–5. No. of Deaths.	6–30. No. of Persons.	6–30. No. of Deaths.	31–40. No. of Persons.	31–40. No. of Deaths.	41–45. No. of Persons.	41–45. No. of Deaths.	46–50. No. of Persons.	46–50. No. of Deaths.	51–55. No. of Persons.	51–55. No. of Deaths.	56–60. No. of Persons.	56–60. No. of Deaths.	Over 60. No. of Persons.	Over 60. No. of Deaths.
Kholwada	29	1	86	1	364	2	68	1	30	—	27	2	3	2	24	1	5	2
Metrana	30	1	188	3	615	13	124	4	9	2	64	4	3	—	27	1	11	6
Pachakwada	31	6	126	8	483	4	138	4	47	1	38	2	33	—	15	—	45	—
Methan	45	5	153	—	537	—	151	1	36	—	28	—	18	—	25	1	27	2
Bhilvan	40	9	91	1	392	4	72	—	6	—	20	—	3	—	2	—	3	3
Sidhpur	422	11	788	5	4,335	34	1,645	15	445	5	702	8	172	9	348	7	172	22
Billimora	191	34	508	16	2,559	40	717	11	221	4	290	5	116	9	163	6	163	37
Dhamdachha	222	14	164	3	672	33	390	5	277	4	217	4	197	3	115	10	181	16
Gandevi	536	37	354	11	2,336	30	2,196	8	909	—	319	4	277	1	202	9	369	30
Gadat	76	2	104	4	380	1	96	—	32	—	43	—	42	—	38	—	67	2
Manekpur	56	8	70	2	267	2	64	1	26	—	31	—	34	1	14	—	28	3
Valoti	43	1	52	1	219	3	155	2	45	—	46	1	56	—	34	—	15	—
Ajrai	43	2	59	1	216	1	45	—	29	1	23	1	19	—	15	1	18	3
Dhanuri	82	4	152	3	499	4	109	1	104	—	52	1	30	—	20	1	53	2
Bajwa	25	2	63	3	190	4	92	2	15	—	12	—	25	—	7	—	24	—
Total	1,871	137	2,958	62	14,054	175	6,062	55	2,231	17	1,912	32	1,028	25	1,049	37	1,181	128
Death-rate per mille	73·2		20·9		12·4		9·07		7·6		16·7		24·3		35·2		108·3	

Grand total of uninoculated persons - - 32,346.
" " " deaths - 668.
Death-rate per mille - - 20·6.

N.B.—The results appear very much in favour of the inoculated at first sight, but if deaths in children under two and in old men over 60 be deducted, the death-rate in uninoculated would be 12·4, viz., very slightly unfavourable as compared with the results in inoculated.

The results of Undhera are not added to the table because the periods of age were different, as requested for by Mons. Haffkine.

APPENDIX U.

TABLE showing VIRULENCE of PLAGUE POISON in the VILLAGES of the BARODA DISTRICT.

Name of Town or Village.	Population.	Plague Attacks.	Plague Deaths.	Largest Number of Plague Deaths in the Week ending		Rate of Plague Mortality per Mille per Annum as calculated on the highest per Week.	What Part of Population died from Plague.	Prevalence of Epidemic from Date to Date.	First Date of Inoculation.	Date of First Case in Inoculated.	Remarks.
						INOCULATED PLACES.					
Ratanpur	268	63	47	12	12.3.98	2,328	1/6th	20.2.98—1.4.98	12.4.98	—	Highest mortality occurred before inoculation.
Kantharia	364	22	22	13	21.2.98	1,857	1/15th	29.1.98—8.3.98	24.2.98	26.2.98	Do. do. do.
Undhera	1,031	141	124	23	29.1.98	1,160	1/8th	22.12.97—26.3.98	26.1.98	21.2.98	Very few inoculations (only 35) before 29.1.98; most operations on 12.2.98.
Bajwa	609	47	37	12	5.3.98	1,024	1/10th	22.1.98—5.4.98	18.2.98	4.3.98	
Koili	3,321	144	129	25	25.3.98 and 1.4.98	391	1/25th	8.1.98—6.5.98	22.2.98	14.3.98	The epidemic had only just begun when inoculations were begun. Most operations done on 5.4.98.
Sakarda	1,929	85	74	13	5.4.98	350	1/56th	14.2.98—30.4.98	17.4.98	—	Highest mortality occurred before inoculation.
Jarod	2,137	61	44	13	18.3.98	316	1/48th	12.3.98—22.4.98	11.4.98	16.4.98	Do. do. do.
Karodya	718	6	6	3	5.4.98	217	1/118th	16.3.98—5.4.98	21.4.98	—	Do. do. do.
Chhani	4,000	73	61	21	2.4.98	273	1/53th	20.3.98—1.5.98	8.4.98	—	First epidemic. Highest mortality before inoculation.
		118	93	15	7.1.99	195	1/83rd	28.9.98 to date.			2nd epidemic.
Savali	6,551	446	321	33	10.9.98	261	1/30th	19.3.98—13.10.98	13.4.98	28.8.98	The number of inoculations is very small.
Baroda	112,471	1,620	1,185	168	3.3.98	77	1/93th	4.4.97—5.5.98	15.1.98	—	The epidemic really began in second week of October. Many cases undetected.
Total	133,399	2,826	2,143	—	—	—	1/62th	—	—	—	

APPENDIX U.—*continued*

Name of Town or Village.	Population.	Plague Attacks	Plague Deaths.	Largest Number of Plague Deaths in the Week ending		Rate of Plague Mortality per Mile per Annum as calculated on the highest per Week.	What Part of Population died from Plague.	Prevalence of Epidemic from Date to Date.	First Date of Inoculation.	Date of First Case in Inoculated.	Remarks.
						UNINOCULATED PLACES.					
Ajod - -	650	35	23	19	21.12.98	1,520	$\frac{1}{94}$th	15.12.98—6.1.99	—	—	
Javla -	324	25	19	8	3.10.98	1,283	$\frac{1}{17}$th	20.9.98—27.11.98	—	—	
Sandhasal -	2,225	263	203	45	20.8.98	1,051	$\frac{1}{15}$th	30.7.98—11.10.98	—	—	
Bhaniara -	988	23	17	10	25.3.98	526	$\frac{1}{58}$th	19.3.98—15.4.98	—	—	
Vasna -	769	18	17	7	11.3.98	473	$\frac{1}{48}$th	5.3.98—29.3.98	—	—	
Dasrath -	1,682	32	31	11	7.1.99	340	$\frac{1}{54}$th	2.12.98—14.1.99	—	—	
Karnali -	1,397	25	17	9	21.12.98	335	$\frac{1}{83}$nd	15.12.98—14.1.99	—	—	
Nani Bhadole.	784	16	9	4	5.11.98	265	$\frac{1}{87}$th	15.10.98—8.12.98	—	—	
Dumar -	1,316	48	33	6	25.11.98	234	$\frac{1}{39}$th	19.11.98 to date.	—	—	
Nameswa -	905	24	16	4	11.10.98	229	$\frac{1}{60}$th	5.10.98—4.12.98	—	—	
Chandod -	3,271	59	50	13	31.3.98	206	$\frac{1}{65}$th	4.3.98—1.5.98	—	—	
		88	66	8	5.10.98	127	$\frac{1}{43}$th	1.9.98—20.12.98	—	—	
Karoli -	827	20	11	3	18.3.98	189	$\frac{1}{75}$th	5.3.98—20.4.98	—	—	
Gothda -	3,402	66	45	11	29.10.98 & 5.11.98	168	$\frac{1}{75}$th	4.9.98—30.11.98	—	—	
Siswa -	2,851	27	21	5	27.7.98	91	$\frac{1}{184}$th	7.3.98—14.10.98	—	—	
Sokhda -	3,439	16	13	5	31.12.98	75	$\frac{1}{304}$th	18.12.98—13.1.99	—	—	
Padra -	8,415	20	18	5	22.3.98	30	$\frac{1}{408}$th	2.2.98—29.3.98	—	—	
Total -	33,245	805	609	—	—	—	$\frac{1}{54}$th	—	—	—	

APPENDIX V.

TABLE showing VIRULENCE of PLAGUE POISON in the VILLAGES of the NAOSARI and AMRELI DISTRICTS.

Name of Town or Village.	Population.	Plague Attacks.	Plague Deaths	Largest Number of Plague Deaths in the Week ending		Highest Plague Mortality per Mille per Annum.	What part of Population died from Plague.	Prevalence of Epidemic from Date to Date.	First Date of Inoculation.	Remarks.
						INOCULATED PLACES, NAWSARI DISTRICT.				
Manekpur -	619	10	10	5	11.7.97	420	$\frac{1}{61}$st	5.7.97—14.9.97	28.4.98	Inoculation performed after the disappearance of the plague.
Gadat - -	1,118	71	48	8	3.3.98	372	$\frac{1}{23}$rd	30.1.98—30.3.98	14.4.98	
Ajrai -	536	7	5	3	9.4.97	290	$\frac{1}{107}$th	6.4.97—9.5.97	27.4.98	
Gandevi -	7,919	324	274	32	8.4.97	210	$\frac{1}{28}$th	25.12.96—5.11.97	19.4.98	
	7,283	8	7	2	3.3.98	14	$\frac{1}{140}$th	28.1.98— 5.4.98		
Dhamdachha	2,676	42	37	9	9.3.97	175	$\frac{1}{72}$nd	17.2.97—11.5.97	13.4.98	Population at beginning of first epidemic.
	2,598	35	27	6	10.4.98	120	$\frac{1}{96}$th	28.2.98—15.5.98		The above minus deaths of first epidemic.
	2,531	13	6	2	4.8.98	41	$\frac{1}{421}$st	4.8.98—12.10.98		The above minus deaths of second epidemic.
Billimora -	5,915	176	124	11	1.5.97	96	$\frac{1}{47}$th	20.12.96—16.10.97	5.4.97	
	5,575	277	217	15	8.10.98	139	$\frac{1}{25}$th	3.2.98—14.1.99		
Valoti -	760	5	4	2	9.3.98	136	$\frac{1}{100}$th	3.3.98—8.4.98	15.4.99	Inoculation done after the disappearance of the plague.
Dhanuri -	1,200	3	3	3	25.2.97	130	$\frac{1}{240}$th	24.2.97—25.2.97	17.4.98	
		2	2	2	10.7.97	86	$\frac{1}{600}$th	7.7.97—10.7.97		
Total -	20,738	—	764	—	—	—	$\frac{1}{27}$th	—		
						UNINOCULATED PLACE, NAVSARI DISTRICT.				
Kosmada -	701	9	6	3	9.4.97	222	$\frac{1}{317}$th	25.11.97—15.1.98	—	
						UNINOCULATED PLACE, AMRELI DISTRICT.				
Bet - -	4,625	9	9	2	26.4.97	22	$\frac{1}{518}$th	25.4.97—26.8.97	—	
		28	22	5	23.12.97	56	$\frac{1}{1}$th	17.12.97—17.3.98		

APPENDIX W.

TABLE showing VIRULENCE of PLAGUE POISON in the VILLAGES of the KADI DISTRICT.

Name of Town or Village.	Population.	Plague Attacks.	Plague Deaths.	Largest Number of Plague Deaths in the Week ending.		Highest Plague Mortality per Mille per Annum.	What part of Population died from Plague.	Prevalence of Epidemic from Date to Date.	First Date of Inoculation.	Remarks.
						INOCULATED PLACES.				
Bhilwan -	684	66	41	20	7.3.98	1,520	$\frac{1}{16}$th	24.2.98—28.3.98	11.3.98	Highest mortality occurred before inoculation.
Pachakwada	996	56	39	14	3.2.98	730	$\frac{1}{36}$th	18.1.98—6.3.98	21.2.98	Do. Do.
Dindrol -	1,019	26	21	10	18.2.98	510	$\frac{1}{48}$th	5.2.98—7.3.98	22.2.98	Do. Do.
Sidhpur -	9,124	516	314	51	9.10.98	290	$\frac{1}{29}$th	7.8.98—15.12.98	27.10.98	Do. Do.
Kholvada -	746	6	4	4	19.4.98	278	$\frac{1}{186}$th	13.4.98—28.4.98	18.4.98	Inoculation performed on the last two days of the week of highest mortality.
Methan -	1,063	14	9	3	28.3.98	146	$\frac{1}{118}$th	23.3.98—29.4.98	25.4.98	Highest mortality occurred before inoculation.
Metrana -	1,079	7	5	2	19.4.98	96	$\frac{1}{359}$th	10.4.98—21.4.98	23.4.98	Do. Do. in first epidemic.
		5	2	1	29.10.98	48	$\frac{1}{539}$th	23.10.98—13.12.98		
Total -	14,711	—	435	—	—	—	$\frac{1}{38}$rd	—	—	
						UNINOCULATED VILLAGES.				
Sendrana -	1,213	76	56	20	12.2.98	857	$\frac{1}{121}$st	6.2.98—21.3.98	—	
Dethli -	1,225	73	47	18	27.8.98	764	$\frac{1}{26}$th	21.8.98—19.10.98	—	
Varsilla -	623	34	19	8	11.2.99	667	$\frac{1}{32}$nd	3 2.99 to date	—	
Mesar -	1,484	88	56	19	22.1.98	665	$\frac{1}{26}$th	27.12.97—11.2.98	—	
Ganglasan -	786	23	15	10	15.10.98	661	$\frac{1}{52}$nd	9.10.98—14.11.98	—	
Kakoshi -	1,733	81	64	20	9.3.98	600	$\frac{1}{27}$th	10.2.98—7.4.98	—	
Rasulpur -	625	21	14	6	15.10.98	499	$\frac{1}{44}$th	9.10.98—8.11.98	—	
Mehelaj -	851	20	13	5	11.12.98	305	$\frac{1}{65}$th	5.12.98—14.1.99	—	
Koonvara -	1,950	25	23	8	27.11.98	213	$\frac{1}{84}$th	17.10.98—15.12.98	—	
Soojanpur -	545	13	4	2	30.12.98	190	$\frac{1}{189}$th	24.12.98—21.1.99	—	
Mehsana -	9,985	25	19	12	3.3.97	62	$\frac{1}{525}$th	18.2.97—27.4.97	—	
Unza - -	11,287	87	71	11	18.2.98	50	$\frac{1}{758}$th	13.10.98 to date	—	
Total -	32,307	—	401	—	—	—	$\frac{1}{80}$th	—	—	

DHANJIBHAI H. MEHTA,
Medical Officer, Plague Duty, Baroda.

APPENDIX No. LIII.

(*See* Question No. 15,511.)

The following REPORT on INOCULATION in BROACH with M. HAFFKINE'S Prophylactic Fluid, addressed to the District Magistrate of BROACH, and forwarded to the Indian Plague Commission by Mr. A. M. DALAL, Managing Trustee of the Broach Parsee Panchayat, is published as an Appendix to the Proceedings of the Commission:—

SIR, Broach, 21st March 1899.

I HAVE the honour to report on Plague Preventive Inoculations performed under the auspices of the Parsee Panchayat, in the city of Broach, from 1st October 1898 to 15th March 1899, as also to furnish information required regarding the population, number inoculated, and mortality of the Parsees of Broach.

The total number of inoculations performed by us up to date is 1,572, of which—

840 are Parsees,
662 are Hindus,
60 are Muhammadans,
10 are Christians.

1,572 Total.

In addition to these, about 389 more inoculations are performed in the city of Broach by other practitioners, of which—

240 are Parsees,
147 are Hindus,
10 are Muhammadans,
1 is a Christian.

398 Total.

The grand total of all the inoculations in Broach comes to 1,970 during these six months of plague.

The population of the city of Broach, according to the last census in 1891, was 40,168, of which—

25,252 were Hindus,
11,354 were Muhammadans,
2,243 were Parsees,
732 were Jains,
93 were Christians,
488 were Animistic,
1 a Jew.

40,168 Total.

The population of Broach, as taken on the 16th March 1899, is 20,000, of which about 14,000 are living in the city, and 6,000 in camps. For statistical purposes, I calculate the population to be on an average about 27,000 during the last six months of plague.

As the number of inoculations performed amongst the Hindus and Muhammadans is too small in proportion to their population, I have confined my information to the Parsees, chiefly amongst whom about 1,080 inoculations have been performed in an average population of 1,843 souls during the last six months.

It will be interesting, as well as instructive, to notice from the details given below, that out of 1,080 Parsees inoculated, only two were attacked with plague, of whom one has died and one has recovered, whilst out of the remaining 763 uninoculated (deducting about 400 as having left the city at this time), nine persons were attacked with plague, of whom five have died and four have recovered. If the inoculated Parsees had suffered in the same proportion as the uninoculated, they should have had 12 cases and 7 deaths, instead of two and one respectively. The number of cases appears, therefore, to be reduced by 83·3 per cent., and deaths by 71·42 per cent.

The comparative freedom from plague enjoyed by Parsees of Broach is in a great measure due to these inoculations as well as to their own good sense of not concealing plague cases.

Out of 809 inoculations performed amongst the Hindus, 90 were tailors, and the lesson which inoculation teaches in that small community is highly interesting. The population of tailors in the city of Broach is 225, and they all are living in a camp outside the town at a place called Nilkanth. They all are placed in exactly the same position as regards their domiciles, mode of living, and social position, and all are equally liable to infection. Out of these 225 tailors, 90 are inoculated and 135 are uninoculated, and the incidence of plague in them was as follows:—

The 135 uninoculated had 10 cases, with 6 deaths;
The 90 inoculated had not a single case of plague.

Had the inoculated tailors suffered in the same proportion as the uninoculated, they should have had six cases and four deaths, instead of having no case. The numbers of cases, and deaths were, therefore, reduced by 100 per cent.

If I were to draw conclusions from the figures of inoculations performed amongst all the castes in the whole of the city, the result will be found to be equally satisfactory.

The average population of Broach during these six months of plague is estimated at 27,000, of which 1,970 are inoculated, and 25,030 remain uninoculated. Table III. of this Report will show that six cases of plague and four deaths have occurred amongst the inoculated; but on closer observation it will be found that the last three cases in the Table were in the incubation stage of the plague when they were attacked, as the symptoms of the disease manifested themselves within ten days of the inoculation. If these three cases are excluded—

The 1,970 inoculated had only three cases and two deaths, whilst
The uninoculated 25,030 had 564 cases, and 460 deaths.

If the inoculated had suffered in the same proportion as the uninoculated, they should have had 45 cases and 37 deaths, instead of three and two respectively. The number of cases appears, therefore, to be reduced by 93·3 per cent. and deaths by 94·5 per cent.

The above figures speak for themselves, whether inoculation acts as a prophylactic against plague or not. Its value as such is unquestionable in an epidemic, according to my experience in this city, and next to evacuation. Government may encourage inoculation as far as possible as a preventive against plague.

In large cities where complete evacuation is impossible, inoculation is the only remedy to be relied upon for stopping the ravages of the disease.

I have, &c.

(Signed) BARJORJI SORABSHAW,
L.M. and S.

To R. E. Candy, Esq.,
District Magistrate, Broach.

I.

INFORMATION regarding the Population and Mortality of the PARSEES of BROACH CITY, with Particulars regarding ANTI-PLAGUE INOCULATIONS during the Epidemic of 1898–9.

1. The total average population of the Parsees during the last six months of plague in Broach is about 1,843. Details of the population according to different ages are not available.

2. Plague first made its appearance in Broach on the 15th September 1898, and the total gross mortality amongst the Parsees in the preceding three months was as under:—

(*a.*)	Under 5 years of age - -	12
(*b.*)	Over 5 and under 60 years -	4
(*c.*)	Over 60 years - - -	—
	Total - -	16

(3.) From the date of the first case of plague the gross mortality was—

(*a*) from plague - - -	6
(*b*) from all other diseases - -	50
Total - -	56

Details for each week will be found from Table II.

4. Out of an average of 1,843 Parsees in Broach about 1,080 have been inoculated, leaving only 763 as uninoculated. The rich and the poor, the educated and the illiterate, have all taken advantage of the inoculation.

5. After the introduction of inoculation, there have been six deaths among the Parsees from plague, and of these five were uninoculated and one was inoculated. Details will be found in Table III.

6. The gross mortality amongst the Parsees from all other causes from 15th September 1898 to 15th March 1899 as—

49	amongst the uninoculated and
1	„ inoculated.
50	Total.

The inoculated Parsee was an old man of about 70 years of age and died from chronic bronchitis and asthma. Other details will be found in Table II.

7. The above figures were obtained from the Inoculation Registers, the Parsi Panchayat's Death Register, the Register of Patients in the Parsee Plague Hospital, and from the census books in charge of Plague Superintendents.

8. (*a.*) I have not noticed any permanent evil effect from inoculation.

(*b.*) Inoculation appears to mitigate the severity of an attack of plague.

(*c.*) I have not noticed a second attack of plague occurring in the same patient.

(*d.*) Inoculation bestows immunity during one epidemic.

TABLE II.—GROSS MORTALITY amongst the PARSEES of BROACH from PLAGUE and from all other DISEASES for each WEEK from the Date of the first case of PLAGUE.

	From Plague.			From other Diseases.		
	Under 5 Years.	Over 5 and under 60.	Over 60.	Under 5 Years.	Over 5 and under 60.	Over 60.
Week ending 21 Sept. -	—	—	—	1	—	2
„ 28 „ -	—	—	—	3	—	—
„ 5 Oct. -	—	—	—	1	—	—
„ 12 „ -	—	—	—	1	—	—
„ 19 „ -	—	—	—	1	1	—
„ 26 „ -	—	—	—	2	—	—
„ 2 Nov. -	—	—	—	1	—	1
„ 9 „ -	—	—	—	1	1	—
„ 16 „ -	—	—	—	—	2	—
„ 23 „ -	—	—	—	2	—	—
„ 30 „ -	—	—	—	1	1	1
„ 7 Dec. -	—	—	—	—	—	—
„ 14 „ -	—	1	—	1	—	1
„ 21 „ -	—	1	—	—	1	1
„ 28 „ -	—	—	—	1	—	—
„ 4 Jan. -	—	1	—	—	—	1
„ 11 „ -	—	—	—	—	2	—
„ 18 „ -	—	—	—	2	—	1
„ 25 „ -	—	1	—	2	1	2
„ 1 Feb. -	—	2	—	—	—	—
„ 8 „ -	—	—	—	1	—	2
„ 15 „ -	—	—	—	2	—	—
„ 22 „ -	—	—	—	—	—	1
„ 1 Mar. -	—	—	—	1	—	2
„ 8 „ -	—	—	—	—	—	—
„ 15 „ -	—	—	—	—	2	—
Total - -	—	6	—	24	11	15

TABLE III.—STATEMENT of INOCULATED PERSONS attacked with PLAGUE.

No.	Name.	Caste.	Age.	Date of Inoculation.	Dose of Inoculation.	Strength of Inoculation.	Date of Attack of Plague.	Discharged.	Died.	Remarks.
1	Pirojsha Bheramji -	Parsee -	31	19 Nov. -	10 c.c.	$\frac{1}{5}$	20.1.99 -	—	24.1.99.	
2	Raychand Nemchand	Hindu -	53	19.1.99 -	4 c.c.	$\frac{1}{2}$	13.2.99 -	—	16.2.99.	
3	Sirrinbai Dossabhai -	Parsee -	13	26 11.98	4 c.c.	$\frac{1}{5}$	18.2.99 -	13.3.99 -	—	
4	Bhani Dev - -	Christian	26	21.2.99 -	6 c.c.	$2\frac{1}{5}$	2.3.99 -	—	4.3.99.	
5	Dhani Lala - -	„	6	25.2.99 -	2 c.c.	$2\frac{1}{2}$	2.3.99 -	—	—	
6	Maheswar - -	Hindu -	55	6.3.99 -	5·5 c.c.	$2\frac{1}{2}$	13.3.99 -	—	14.3.99.	

(Signed) BARJORJI SORABSHAW,
L. M. and S.

APPENDIX No. LIV.

(See Question No. 16,045).

PLAN OF THE MAHIDHARPURA WARD OF SURAT,

Showing the manner in which the infection of Plague was traced from place to place.

Put in by Mr. H. M. JUDGE.

APPENDIX No. A

NOTES

ON

STEAM TREATMENT FOR THE PLAGUE

BY

MR. A. LESLIE, BOMBAY.

ON my return to India in July 1897, Bombay had already had nearly a year's experince of the plague, but nothing much was really known about the disease, and as time went on and the hopelessness of the medical profession in treating it became increasingly obvious, it occurred to me that some good might be done by trying the water system advocated by Louis Kuhne of Leipsic. I was too occupied for several months with other affairs to more than think over the subject, but in February, 1898, when the recrudescence was at its height, I took opportunities of ventilating Kuhne's theories to some few medical men of my acquaintance and to some members of the Plague Committee. The result was that about the middle of this month I secured an introduction to Dr. Herbert A Julius, R.N., who was in charge of the Mody Khana Hospital, and having very carefully gone into matters with him, it was arranged that experiments might be made at this hospital. In those days the vast number of patients coming in gave the staff more work than they could thoroughly cope with, and I found that from the nature of things I should be left very much to my own resources. Hospital assistants were not to be had for love or money, and I had to rely on two of the ward boys, who were most devoted and attentive, for the immediate help I required. Part of a small ward was made over to me, and in this I fitted up the couch, copper kettle, and hip bath for the experiments. The couch, upon which we have made no improvement, was of the "Cleopatra" type, that is a long open-work cane couch on four high legs with an adjustable head rest. Around the couch cloth was tacked forming a petticoat to prevent draught reaching the patient from below, and in the chamber so made the crosshead of a steam pipe was placed. The patient lay at length naked on the couch, over him were two basket cradles, forming when covered with sheet and blankets a sort of funnel in which he was ensconced. The head down to the neck was exposed to the ordinary air, and the steam was applied to the trunk and extremities only. Having placed the patient in this position, the next thing was to turn on the steam with which he rapidly became enveloped. With the small appliance I had at the time, regulation of the steam was impossible, so if we generated too much heat the only thing to do was to let some of it escape by lifting up a corner of one of the covering blankets. The temperature was, however, never very high, and probably a maximum of 112° was all we attained. The steam bath, no matter what the condition of the patient, lasted 30 minutes exactly. He was then taken out, thoroughly wrapped up from the middle of the thighs downwards and from the diaphragm upwards (excluding the head only), and placed in an abdominal bath of special construction at a temperature of about blood heat; the abdomen was then rubbed gently with a piece of rough jute cloth, the whole time he remained in this position, while the temperature of the water was more or less rapidly reduced to 80 or 75° Fahrenheit. After 10 to 15 minutes in this bath a considerable cooling of the system had taken place, and the patient began to feel somewhat chilly. When this occurred the abdominal region was distinctly cold, relatively speaking, to the touch, and the time had arrived to put the man back on the couch, dry him quickly, replace him on his cot, and cover him well up with blankets. The whole operation lasted 45 to 50 minutes, and as I could only devote my early mornings to the treatment, it frequently happened that not more than one or two cases were taken per day. The above is the treatment and *modus operandi*, and although the cooling abdominal bath has been discontinued in the great majority of cases, I am still disposed to think that its action is distinctly beneficial, and that further experiment with it will prove the correctness of my view.

ARGUMENT.—In all diseases such as plague-fever medical experience seems to point to two ways of treatment. One is to strangle the poison in the system, the other to assist nature to eliminate it. At present the former is most in favour and is known in common parlance as the serum treatment. One has only to remember the effect of Roux's anti-toxin of diphtheria to admit that grand results have been obtained from this method. But the true anti-toxin of plague has yet to be discovered, and bacteriologists are still in dispute among themselves as to the true nature of plague. Until they have agreed let us see what elimination can do.

In all cases of fever the state of fever originates, I take it, from a process of fermentation going on within the body. The substances capable of fermentation are probably present in most of us, and they may be set in motion by climatic change, some peculiarity of the air, external shock, and, I think we have good reason to believe, as regards plague fever, very often by mental excitement. The substances as they ferment press against the elastic covering with which nature has endowed us, and as the fermentation grows the skin becomes more and more impervious, and internal pressure is increased. The increase in size of people suffering from fever, small though it may be in many individuals, is sufficient indication that this is the case. How, then, is this internal pressure, which is not only striking outwards against the skin, but is also forcing itself into and about all the tissues and organs of the body, to be relieved? The answer may be found in the application of that law which causes the boiling kettle to force up its lid when the spout does not carry off the excess steam formed. In a state of fever we have an excess of steam generated within the body, and in the act of generation the safety valve has become blocked. The outward application of steam opens all the little safety valves that nature has provided through the marvellous mechanism of the skin, and so relieves the internal pressure which is causing the trouble. From what has been said about the application of steam, it is apparent that it is only necessary to resort to it in grave crises of disease. The abdominal bath should, I venture to think, be more directly curative in its action. At a temperature of some 20° to 25° below blood heat the cooling of the body and massage of the abdomen, while in the water, tend to disperse the blood and contract the vessels about what may be termed the fire-box of the human system. In other words, the cooling process causes the blood to flow away from the main drains of the system into the remote parts, and when this is accomplished, and a thorough cooling has taken place, the reaction induced either by gentle exercise or by warm wrapping up causes a return flow, which brings back with it some of the morbid matters which have collected in various parts of the system, and finally promotes their ejection through the kidneys and bowels. I have noted in treating plague patients that almost invariably free action of the kidneys has taken place after this bath, and that not infrequently good action of the bowels has resulted from the same cause. Indeed, in some instances, the action has been so rapid that I have come to the conclusion there is still a great deal to be learnt regarding the duration and temperature of the abdominal bath.

SOME CASES.—The Case Book at the Mody Khana Hospital disappeared in the fire which burnt down all

the buildings, and I do not know how many cases were treated there, or what percentage of recoveries was secured. I have a distinct recollection, however, of two interesting cases, so I give them.

No. 1 was a mill hand, aged about 20 years, well nourished, and when I took him in hand he had been in hospital several days. I was looking round for a patient one morning, and one of the nurses begged me to take this young man, as he had kept all the ward on the move the whole night, and nothing would make him quiet. He managed to undo all the knots every time he was tied in bed, and went raving about, getting alongside other patients or lying under their beds. I am not certain that he had not done this for two nights. When he was taken into my ward every part of him which could move was going, and he kept up a senseless chatter the while. By tying down the cradles and holding the end of the blanket under his chin, I managed to prevent him from jumping about too much when we started the steam. Within ten minutes the perspiration was standing in beads on his forehead, the restlessness had completely disappeared, and he did not move. The change was so quick I feared there might be some heart trouble, but on feeling his pulse I was reassured. I let him stay quite quietly for another 10 minutes or so, and then asked him how he was getting on. He promptly replied that it was "*bohut gurum*," and that he was surely going to die immediately. I allowed him to go on repeating this a few times, and then diverted his attention by asking his name, his age, and so on, and got him to show me his tongue. Consciousness by this time had completely returned. After the 30 minutes steam he had about 15 minutes in the abdominal bath. This revived him tremendously, and when we had rubbed him down and wanted to put him on his cot, he was for making tracts homewards, asserting that he was perfectly well. I am happy to say that he was not far wrong, the head symptoms never returned, his bubo quickly healed, and some three weeks later he came up to salaam me in the street.

No. 2.—This was a Portuguese youth, probably 22 or 23 years of age, who was brought into the hospital on a morning when a great many cases arrived about the same time. He came with relatives, and they appeared to be of a very respectable class. As I saw him on the ambulance, he looked to me to be so alarmingly ill that I begged Dr. Julius to come out and see him at once. We found it was a twelve-day old primary pneumonia case, and the verdict was "no hope." I wanted a case at the time and got permission to take this one, but one of the nurses who was present asked me to give some other patient, not in *extremis* as this man was, a chance. The impression was that he could not last four hours. I persisted, however, and treated him exactly as before described, with the result that his breathing was eased, his temperature declined, and in all respects he became better. Something intervened to prevent my going to the hospital the next day, but on the third morning he was still alive. His condition, however, had again become very bad, the breathing being most distressing. To relieve this, we tried giving him some inhalations of oxygen which I generated beside his bed. These relieved him temporarily, and were repeated later on. The case, however, on the fourth or fifth day proved fatal, but I cannot help thinking that the treatment nevertheless prolonged his life.

Soon after the fire occurred at Mody Khana, my friend Dr. Julius was himself taken ill and had to give up work and go into hospital. His successors were constantly changing, and the accommodation in the segregation camp to which patients had been moved was insufficient for my requirements. I, therefore, with the assent of the Plague Committee, moved my plant to Grant Road Hospital. The day of the fire will always be regarded as a specially black day by me, for Dr. Julius in the midst of all his labours had found time to keep an eye on my operations, and had arranged on the very next morning to begin to take clinical observations on steam bath patients. The fire, of course, upset everything, and Dr. Julius's illness and subsequent transfer prevented further help from him.

GRANT ROAD HOSPITAL.—Of the work of this hospital I have no records. Very few patients were taken, the medical officer was not sympathetic, and the subsequent riots which took place, and rapid decline of the plague prevented my doing much. One interesting case, however, I may mention; the patient was one of the ward boys. He contracted plague and developed it very rapidly. After only a few hours his temperature was 105°, pulse 130 odd, and respirations 33. The resident medical officer, Mr. Eknath H. Hâté, who had taken a great interest in my operations, decided to treat this man by steam. He gave him the baths as before described, and within six hours the temperature was down to nearly normal, pulse 80, respirations 18. The man's buboes developed, were incised, and healed in due course. He never had any return of any bad symptoms and became rapidly convalescent.

With the closing of operations at Grant Road, our amateur experiments may be said to have come to an end, for when in September last we started again, this time at Arthur Road Plague Hospital, I had secured as my assistant, Mr. Hâté, who had been the resident medical officer at Grant Road. During the two periods from September to December, 1898, in which we worked at this hospital, the results continued to be favourable, but the cases were too few in number to form any basis of statistical value. Mr. Hâté, who has at all times shown himself to be a most indefatigable, able, and intelligent man, made very careful records of the cases he took, and these are available. I believe them to be thoroughly accurate, but as Mr. Hâté has not yet taken his degree, he is conventionally unable to give evidence which would have that weight which is usually granted to evidence produced by a qualified man. From the medical point of view, however, the results confirmed what I had myself observed in treating patients with my own hands. Our next move was to the Mahratta Hospital, and by this time, being satisfied that the results warranted experiments on a larger scale, I approached the Municipality with a view of getting a boiler and making arrangements so as to be able to treat four patients at one time. Mr. Harvey, the Municipal Commissioner, very kindly and promptly overcame all difficulties in meeting my wishes, and instructed Mr. Hewett to send down a boiler and make the pipe connections required. With a hospital nurse and an increased staff of ward boys we commenced operations with this new plant on the 26th of January last, and I will now leave Dr. Twigg to tell his own tale in the report which follows:—

REPORT BY DR. H. J. R. TWIGG, I.M.S.

A few introductory remarks may not perhaps be out of place here. Mr. Leslie at the end of last year requested the medical officer in charge of plague operations to ask some medical man to make a few clinical observations with a view of forming a decision as to the merits or demerits of the steam bath treatment of plague. And it is solely from that point of view that I have endeavoured to draw up a report. What is here appended is mostly an enumeration of results along with a few remarks, which I think should in fairness be added, together with my opinion of the method. I take no particular personal interest in the matter of any theory or theories which may exist as to the action of the steam bath—how it acts and what it does, and if it fails or succeeds, in what direction it does so I leave to a later and fuller report to be forwarded to proper channels at a later date. Every effort has been made to be strictly fair—and to be fair in statistics is particularly difficult. I now here give merely a few results. They touch upon three or four points:—

(1.) Does the bath save more cases than ordinary drug methods?
(2.) Does it prolong life?
(3) Does it add to the general comfort and well-being of the patient?
(4.) Does it create a bad or a good impression upon the patient and his friends?

1. *Does the bath save more cases than ordinary drug methods?*

Admitted to the Mahratta Hospital since December, 1898, up to end of enquiry:

Total cases - - - -		1,100
Of whom (1) records lost - -		14
(2) Observation cases. Not yet diagnosed -		23
(3) Other diseases than plague - -		261
Balance -		812

These 812 cases were grouped according to treatment as follows :—

(In order of magnitude.)

			Per cent.
Mercurial treatment -	187 cases ;	fatality	147 = 78·6
Native treatment -	177 ,,	,,	137 = 77·4
Stimulant treatment -	106 ,,	,,	99 = 93·39
Iodide of Potash and Expectorant -	93 ,,	,,	90 = 96·77
A Miscellaneous group of cases, the records of which were not complete in the matter of treatment, but which were in the great majority not Native treatment cases, and none of which were bath cases - -	69 ,,	,,	69 = 100·00
Lustig Serum treatment - -	11 ,,	,,	9 = 81·81
The Bath treatment -	169 ,,	,,	123 = 72·78
Average Mortality -			= 85·82

Bath Mortality = 72·78 per cent. (169 cases, 123 fatal).

Non-Bath = 85·6 per cent. (643 cases, 551 fatal).

EXCLUDING NATIVE CASES.

Bath mortality - -	=72·78 per cent. (160 cases, 123 fatal).
Non-Bath Mortality -	=88·8 per cent. (466 cases, 414 fatal).

Expressing those figures in another form we have the following results :—

(1.) Comparing all cases, native treatment and others together, we have out of 643 non-bath cases 551 deaths —to have 551 deaths by bath methods we should need 169 multiplied by 551 and divided by 123 patients, equals 757 patients.

That is to say, there would be as few deaths from 757 bath as there would be from 643 non-bath cases—a difference of 124 lives.

(2.) Comparing other than native treatment cases in a similar manner, we have the result that to have 551 deaths we must have 757 bath cases or 621 non-bath cases—a difference of 136 lives.

That is to say, in dealing with these 1,100 cases, 812 of which only are plague, had all of the latter been treated on all the drug and serum methods mentioned, but not by the bath, 695 would have died; according to the statistics, had all been treated by bath methods, the mortality would have been 590 cases—in fact, 105 additional lives would have been saved by this difference in treatment; and on the non-native treatment cases alone (635 cases), the saving of life would have amounted to 101 lives, while in 812 cases the saving would have been 130—the authorities in fact would have found it necessary to put up two more convalescent wards.

2. *Do bath cases live longer than non-bath cases?*

In order to test this point—and its only importance is that it is an indication that at least there is something denoting that the bath treatment is an assistance and not a hindrance to recovery—I have without the slightest knowledge of what the results would ultimately be, selected 60 consecutive fatal bath cases, and with them contrasted 60 other fatal non-bath cases. These cases correspond as far as is possible in every point—sex, age, locality of residence, date of admission to hospital, physical state of the patients, have all been considered in making a fair comparison, and the result is most interesting.

It is obvious that only fatal cases can be taken. Consider for a moment what happens to a patient who recovers. More often than not the date of his leaving the hospital is a matter of expediency—depending to a certain extent upon the accommodation or lack thereof in the convalescent ward—he may in fact be delayed in hospital a day or two for some secondary affair apart from his illness—to compare periods which may vary from such extraneous causes would be obviously unfair.

The results expressod for 600 cases is as in the following table :—

NUMBER OF DAYS SURVIVING IN HOSPITAL.

Length of Survival.	No.			Bath.		
13 days	10 cases	=	130	days of existence.		
12 ,,	20 ,,	=	240	,,	,,	
11 ,,	10 ,,	=	110	,,	,,	
10 ,,	10 ,,	=	100	,,	,,	2,560
9 ,,	30 ,,	=	270	,,	,,	
8 ,,	30 ,,	=	240	,,	,,	600 cases
7 ,,	10 ,,	=	70	,,	,,	per man
6 ,,	10 ,,	=	60	,,	,,	= 4·26
5 ,,	60 ,,	=	300	,,	,,	days
4 ,,	80 ,,	=	320	,,	,,	average.
3 ,,	130 ,,	=	390	,,	,,	
2 ,,	130 ,,	=	260	,,	,,	
1 ,,	70 ,,	=	70	,,	,,	
	600 cases.					

Length of Survival.	No.			Non-Bath.		
13 ,,	0 ,,	=	0	days of existence.		
12 ,,	0 ,,	=	0	,,	,,	
11 ,,	0 ,,	=	0	,,	,,	
10 ,,	10 ,,	=	100	,,	,,	1,610
9 ,,	0 ,,	=	0	,,	,,	
8 ,,	80 ,,	=	80	,,	,,	600 cases
7 ,,	70 ,,	=	70	,,	,,	per man
6 ,,	0 ,,	=	0	,,	,,	= 2·7
5 ,,	10 ,,	=	50	,,	,,	days
4 ,,	90 ,,	=	360	,,	,,	per man.
3 ,,	170 ,,	=	510	,,	,,	
2 ,,	140 ,,	=	280	,,	,,	
1 ,,	160 ,,	=	160	,,	,,	
	600 cases.					

This table, which I have elsewhere expressed by the graphic method which gives a far better idea of what actually occurs, must not be read too literally; for example, looking at the non-bath cases, it would be absurd to suppose that whereas 10 out of 600 non-bath cases lived to the 8th day, and 10 lived to the 10th day, not one out of the 600 lived to the 9th day. The object of the table, however, is to show that taking numbers of cases together, the bath cases certainly live longer than the non-bath cases. If the bath were a depressing, exhausting agent, as I have heard stated, then surely the opposite effect would have been the case; and this would have been all the more probable, inasmuch as all these are fatal cases, and therefore the more likely to be sensitive indicators, if I might use such a term, of depressing or injurious external conditions.

The relative figures 4·26 days for bath and 2·7 days for non-bath cases accord with my general ideas as to what actually occurs in the wards.

3. *Does the bath add to the general comfort of the patient?*

It is almost the unanimous opinion of those who have had opportunities of seeing bath patients that they are much relieved by the treatment. I am not here entering at all into the matter of cure. I merely refer to the matter of alleviating misery. Many of the patients fall off to sleep before they leave the bath-room, while many others sleep soon after they have been placed back in the ward. A very noticeable feature is that whereas retention of urine has often been a matter of no little trouble to those on attendance, recently there have been very few cases of this trouble. And while talking about relieving the cases of those who nurse the sick in the wards, I might narrate somewhat in detail what my experience has been. It has become quite the custom, if I might use the phrase, with those in attendance at the Mahratta Hospital to call for the services of the gentleman presiding over the steam bath to assist them in overcoming passing difficulties. The Sisters send across messages that so-and-so is very noisy—might she have a bath, and somebody will not sleep on bromide and is very exhausted—the doctor has a case with very high temperature; might she be bathed? I might say that all these requests have been promptly attended to, and that without any thought of how statistics would be affected. And so it has come about that the delirious, the restless, those with high fever and in exhausted conditions

have for the great part constituted the cases from which these records have been made.

And in the matter of taking fresh cases when admitted things have been not a whit more favourable. It would have been better from some points of view to have taken alternate cases and compared them, but as a matter of fact bad, very bad, cases were taken without hesitation. During the end of January and early in February batches of very bad cases came, and I doubt whether any treatment at present in vogue would have saved any of them, and of these I took—the worst.

There are a few cases which undoubtedly do badly in the bath, but they do not exceed five per cent. of all the cases treated. What is the reason thereof I cannot say, nor could I pretend to predict before a patient had a bath whether he would or would not prove such a case. Speaking in general terms the patients who do badly are generally nervous, or in a passing state of the fear—at least the great majority of them are women. I have found that by a slight alteration in one of the fittings of the bath, less discomfort is produced, and these cases that do badly are now not so common as formerly.

j. The general impression created by the bath.

There can be no doubt as to the popularity of the bath with the patients and their friends. The result is that they are far more amenable to treatment, and thereby to a certain small degree assist those around them in bringing about improvement. In many of the bath cases I have been in the habit of taking blood from the finger or arm for bacteriological purposes, and, although I much wanted to continue the custom, I was constrained by the representations of the nurses and sisters from so doing. It appeared that the mysteries of a needle heated in a flame, a long glass pipette, some unknown lotion in a bottle, the drawing of blood and the careful secretion of the same in a curious tube, struck terror in the minds of many of the patients. Very unwillingly I have given up the practice now as a routine performance, but I have from it learned the lesson that there is a great difference between dealing with a patient who looks upon you with horror and fear as contrasted with a patient who feels no fear of what you are doing. Far be it from me to say this in any disparagement of bacteriological methods, for I might add that I shall rejoice when I hear some curative serum has been prepared which will make effective inroads and check the enormous fatality among plague cases. But till that comes we must do what we can, and doing it we must get our patients to assist us, not check us.

I will now add a few words indicating the plan I adopted in taking notes of a bath case. Every fresh bath case was thoroughly overhauled, and a regular programme of inspection followed. A nurse who was engaged to attend only to bath cases was given a list of them, and she would independently take note of the temperatures, pulses, and respirations of the patients. The cases were then sent to the bath-room, and there observations were made as frequently as possible—every five minutes or less, the pulse and respiration were carefully examined and all noteworthy changes at once entered up on a slate with which each bath was provided. Special methods were adopted for preventing any preconceived ideas from leading to error, and everything was done with a strict regard to fairness. At the end of the day my nurse, Mrs. C. West, who did her work exceedingly well, and assisted me very much by her records, would bring me the full list of temperatures, pulses, and respirations, both before and after the bath, and these were appended to the various bath reports obtained by myself or my assistants.

My earliest feeling on the question of steam baths was one of complete indifference, or if not that, it was tinged with a certain feeling of scorn, but I must now candidly declare my opinion that that has left me. Personally, as I have said before, I lean towards the serum method of treatment. At least I know I have not had any tendency to smooth matters for the bath. While going over the records (with nearly 900 cases to review one has a fair field to work in) and noticing the classes of case admitted to the wards, I feel that the non-bath cases were decidedly milder than the bath cases. In the first place, I resolutely rejected any trivial case lest it should be said that good results had followed by selecting mild cases; on the other hand I preferred bad cases, and in the second place I willingly attended to the numerous messages I received, that "So-and-so is bad—might he have a bath?" It is not easy to express numerically one's ideas about the relative severity of two cases; but taking all the bath cases and comparing them with all the non-bath cases, I should, to be quite fair, judge the severity of the two to be as 1 to 0·75.

As to Lustig's serum cases, only eleven were in the hospital at the time, and to comment unfavourably upon so small a number is unfair. With these remarks well in mind, it appears probable, I think, that the Steam Bath is a valuable adjunct in the treatment of plague. With theories I am in no way concerned, and must consider myself absolutely opposed to Kuhne's views. But I have been asked to test facts, not theories. My results at first greatly astonished me, especially in the matter of the very high mortality from all cases, but after all it is only what we might expect from carefully watching what goes on day after day at the Mahratta Hospital—patients come in, in file almost—it is only a few—a very few—who find their way to the convalescent ward. When one has to deal with large numbers—and the authorities now have to deal with very large numbers—a decrease in the percentage of mortality, apparently small in itself, means an enormous saving in life. Personally, I am thoroughly prepared to stand by my belief that pending the introduction of some method which gives obviously improved results, the steam bath treatment is a wise treatment to adopt—it most certainly does no harm. I am equally certain it does the individual a certain amount of good—with collections of individuals in wards it goes far to produce quiet; it is very cleansing to the patient, and it displeases nobody. With a fairer method of allotting cases I estimate that the bath cases would vary in mortality somewhere between 55 to 65 per cent., but below rather than above 60 per cent. Taking similar cases, I consider it 20 per cent. better than any non-bath drug treatment at present in use at the Mahratta Hospital.

In conclusion, let me again say I hold myself responsible only for the part of this report, and not for Mr. Leslie's portion.

H. J. R. TWIGG.

The first feeling I experienced on seeing the percentage of deaths under the steam bath treatment was one of bitter disappointment. But on closer study I must own the statistics gave me more hope, and I think the more keenly they are scrutinized the more encouraging they will appear. There has been no juggling with figures, and Dr. Twigg is in a position to prove every statement he has set forth. From every standpoint the steam treatment seems to show favourably right along the line. It must not be forgotten that the period of Dr. Twigg's observation covers a time when plague was in its most virulent state, and that all comparisons are made with corresponding cases occurring at the same time, and, so far as it was possible, amongst patients suffering from exactly the same type of the disease. Looking at the statistics of the treatment with an absolutely impartial eye, I am satisfied that though the scale has been held as justly as possible the beam, if anything, has tipped on the side of the "con" rather than on that of the "pro." The treatment breaks no caste prejudices, it is simple and the people like it. Patients on arrival frequently asked for the "Warf" treatment at the Mahratta Hospital nowadays. If we can only devise something which will give the people confidence we shall secure patients in the earlier stages of the disease, and when this comes to pass I have no doubt in my own mind that the advantage of the steam treatment will be plain to all. We are dealing with a curative agent more powerful than any ordinary drug, but of which I do not pretend to understand the possibilities. I can no longer devote time to the study of the subject, fascinating though it is. My occupation lies in other directions. But I would beg the authorities to continue the work. The treatment is not perfected, and much observation and study are still necessary. Dr. Twigg has shown the keenest interest in the process, and has worked hard during the past four weeks to secure the definite results he has obtained. Without such ungrudging help as he has given me it would have been impossible to advance matters to the present position, and I am deeply indebted to him. I would also take this opportunity of recording my grateful acknowledgments Dr. Herbert R. Julius, R.N., Lieut.-Col. T. S. Weir, I.M.S., Health Officer, Lieut.-Col. J. S. Wilkin, I.M.S., and Khan Bahadur Dr. N. H. Choksey, for the assistance and encouragement they

have given me, and to Mr. W. L. Harvey, C.S., Municipal Commissioner, for the boiler and pipe connections he so kindly lent me, to Mr. B. H. Hewett for fitting them up, and to Sirdar Mir Abdulali Khan Bahadur, and the Committee of the Mahratta Hospital for the wards they built for me, and for the facilities they were good enough to afford me.

My last word on the treatment is that the verdict may go with the evidence.

To the classes who are subject to the plague I offer the following advices:—

1. Do not use the mud of the streets as the material with which to clean your cooking pots and pans.
2. Avoid at all times putting *kamblies* over your faces when asleep. If you are predisposed to disease of any kind there is no surer way of developing it than by re-breathing the air you have expelled. Fresh air never killed anybody; see you get plenty of it at all times.
3. At the first sign of feverishness try to induce free perspiration. You do not want an elaborate arrangement such as we have at the hospital. Drugs may be ineffectual. Nim and tea leaves, coffee berries and butter-milk are superfluous; but the virtues of hot bricks and a vessel of water are not yet played out.

I have had to draft these notes against time, and am sure they bear the impress of hurried composition. But I trust sufficient has been said and done to prove the treatment a success, to indicate that it has immense possibilities, and induce those responsible for the public health to continue it.

ARTHUR LESLIE.

Bombay, 21st February, 1899.

APPENDIX B.

PAPERS regarding the PLAGUE in CALCUTTA in 1899 to the end of May.

I.—MUNICIPAL DEPARTMENT—(MEDICAL).

Calcutta, the 24th February 1899.

RESOLUTION—No. 1145, Med.

BY a Notification, No. 6026, issued by the Municipal (Medical) Department of this Government on the 10th October 1898, it was announced that Calcutta was free from plague, no fresh case of, or death from, the disease having occurred since the 28th September. In a Resolution published on the same date, the Lieutenant-Governor drew attention to the danger of a possible re-appearance of plague, and expressed his desire that the ward family and caste hospitals which had been opened under private management should be maintained in working order, and that the precautions which had been taken to stave off an outbreak, and to deal with it if it should arise, should not be relaxed.

2. Since these announcements were made, dropping cases of a suspicious character have been reported from time to time, some of which were of such a character as to leave little room for doubt as to their having been genuine plague. Until recently, these have been so few in number, so isolated, and for the most part so far open to doubt that it has not been found necessary to re-impose the restrictions which were withdrawn in October; and the Lieutenant-Governor, while fully cognizant of their significance, has thought it sufficient to report their occurrence from time to time to the Government of India, and to the various Foreign Governments, as required by the terms of the Venice Convention, still entertaining the hope that with the passing of the cold season they would disappear.

3. This hope has, unhappily, not been realised. During January, 15 cases with 13 deaths were reported. During the present month, up to the 23rd instant, there have been 27 cases with 24 deaths, and the numbers reported during the latter part of the month are greater than in the beginning. In some wards of the town also, and, notably, in Ward No. V., the total registered mortality from all causes has lately risen in a marked manner above the normal rate, and though there is no direct evidence that this is due to plague, the absence of any other known cause is at least a ground for suspicion. Reports have also reached Government which point to the possibility that attempts may be made to conceal the occurrence of cases, the sufferers being turned out of their houses by the landlords or the other inmates, through fear of infection or for other reasons, and forced to seek shelter elsewhere. Intimation has been received that the authorities in Egypt have decided to apply the plague rules against arrivals from Calcutta: and orders have been issued by the Government of India that the regulations of the Venice Convention shall be enforced against Calcutta at the ports of Aden, Madras, and Rangoon.

4. In these circumstance the Lieutenant-Governor is compelled, with much regret, to re-impose the restrictions which were withdrawn in October 1898. A Resolution is under issue prescribing that the inspection of the passengers and crews of vessels leaving Calcutta for ports out of India shall again be conducted by day on shore at the time of embarkation, and the fact that this has been done will be endorsed on the bill of health to be granted before any such vessel leaves the port. Correspondence has recently passed regarding a proposal that the clothing of the crews and deck passengers of vessels proceeding on long voyages shall be disinfected before departure. The Lieutenant-Governor was at first in hopes that this measure might not be necessary, but in view of the altered condition of things this is no longer possible. In communication with the Liners' Conference and the late President of the Chamber of Commerce, he has drawn up a scheme to give effect to the proposal, and arrangements will be made to bring it into force as soon as the apparatus can be procured. Orders are also under issue to provide for the inspection of passengers by train in the same manner as was done prior to October 1898.

5. The Lieutenant-Governor has also had under consideration the question of revising the regulations for dealing with plague in Calcutta itself. Those now in force are contained in Plague Regulation No. 9, dated 10th November 1897, and were drawn up with reference to the experience which had been gained in Bombay and elsewhere, before any case of plague had occurred in Calcutta. In substance, the Lieutenant-Governor sees no reason to doubt their propriety and efficacy. In some points of detail, however, later experience has suggested improvements. In order that effective measures may be taken to prevent the spread of infection, it is of the first importance that every case which occurs shall be promptly brought to the notice of the authorities. Foreign Governments would have just cause for complaint if the measures adopted locally were such as to lead to the concealment of cases; nor can the Local Government hope to cope successfully with an outbreak if the regulations in force are so repugnant to the sense of the people affected as to drive them to withhold information and hide away their sick instead of bringing them forward for treatment. Experience has shown that success has attended the system prescribed in Rule 46 of Plague Regulation No. 9, by which persons found to be suffering from plague are, at their discretion, permitted to resort to ward, caste, or family hospitals, maintained by private contributions, instead of being removed for segregation to the special plague hospitals at Maniktala, Marcus Square, and the Budge-Budge Road. Still more satisfactory has been the arrangement frequently resorted to by which persons are permitted to set apart portions of their dwelling or garden houses, under due restrictions, for use as private hospitals for themselves and their families. In the case of the poorer classes, however, the arrangements have not worked so well. It is amongst the poor that the majority of the patients has usually been found; and any system is defective which leads these ignorant and superstitious people to resort to any shift rather than expose themselves to the chances of compulsory removal to a plague hospital or segregation camp.

6. The Lieutenant-Governor is, therefore, of opinion that measures must be taken to apply in the case of the poorer classes also the system which has so far worked well in respect of classes higher in the social scale. In future no person shall be removed to a public hospital under Rule 46 of Plague Regulation No. 9, without his consent, provided that suitable arrangements are made for the treatment of the case at home. If there is any ward, caste, or family hospital for admission to which he is eligible, and to which he is willing to go, he may be moved thither. If there is no such hospital available, an endeavour should be made to explain to the patient or his friends the advantages which he would obtain in a public hospital in respect of treatment, attendance, and surroundings. But if, notwithstanding this, he still prefers to be treated at his own home, arrangements shall be made to adapt the latter for the purposes of a private isolation hospital. The other inmates, except such as are in attendance on the patient, should be induced to remove elsewhere. Medicines and medical attendance should be provided free of cost, and on the recovery of the patient (or after his death, if the case should terminate fatally), the premises should be either thoroughly disinfected, or, if necessary, demolished, compensation being paid to the owner. All clothing or bedding which is likely to have become contaminated should also be at once disinfected in the Equifex disinfector or destroyed on payment of compensation. If any structural or internal alterations in the house or hut appear necessary in order to render it suitable for its purpose, these shall be carried out by the Chairman and the Health Officer at the public expense.

7. By these measures, the Lieutenant-Governor hopes to secure the active co-operation of the public in the reporting of cases promptly as they occur. There is at present no serious ground for alarm. Such cases as have occurred are undoubtedly sporadic. The season of greatest danger is nearly passed. Much has been

done during the past two years to improve the conservancy of the town, and to introduce a higher standard of cleanliness. The municipal establishments have been strengthened, and a strong staff of competent medical and sanitary officers is at hand. The course which the disease has so far taken in Calcutta is such as to warrant the hope that the town may yet escape a serious outbreak. And the Lieutenant-Governor is confident that all classes of the community will unite with the authorities in their efforts to ward it off.

By order of the Lieutenant-Governor of Bengal,
E. N. BAKER,
Officiating Secretary to the Government of Bengal.

II.—Letter No. 905 of the 22nd March 1899 from the Secretary to the Indian Plague Commission to the Secretary to the Government of Bengal, Municipal Department, Calcutta.

Sir,

I am directed by the Indian Plague Commission to ask that, with the permission of His Honour the Lieutenant-Governor, the Commissioners may from time to time be favoured with information as to the manner in which the plague measures prescribed for Calcutta by the Resolution in the Municipal Department (Medical), No. 1145 of 24th February, have worked in the town.

2. The Commissioners would be obliged if information could be specially given upon the following points:—

(i.) The number of persons sent to hospital (*a*) voluntarily, and (*b*) against their wishes on the ground that suitable arrangements could not be made for their treatment at home.

(ii.) The number of cases left for treatment in their houses, (*a*) on the ground that they were moribund, and (*b*) on the ground that suitable arrangements had been made for their treatment at home.

(iii.) The effect of the measures on the concealment of plague illustrated by (*a*) the amount of plague sickness reported, (*b*) the proportion of male and females who were attacked and died of plague, and (*c*) the relation between the total mortality at present, the recorded plague mortality, and the average mortality in past years.

(iv.) The effect of treatment of patients at home on the spread of the disease, (*a*) on the other residents of the infected house, and (*b*) in the neighbourhood.

(v.) The effect on the spread of the disease of the removal of the inmates of an infected house, other than those in attendance on the patient, to another locality.

3. The Commissioners are leaving India on the 25th of this month. It is of the greatest important that such information as may be available as to the results of the experience now being obtained in Calcutta, should be before them before their report is prepared. They would, therefore, be obliged if the information asked for in this letter could be sent month by month to my address, c./o. the India Office, London, beginning with the results observable up to the 31st of March. It is also desirable that it should be sent as soon as possible after the close of the month to which it relates.

4. The Commissioners trust that His Honour the Lieutenant-Governor will accept the importance of the observations now being made in Calcutta as justifying them in asking for detailed information regarding it.

III.—Letter No. 213 $\frac{T}{Plague}$. (Municipal Department.—Medical) dated Darjeeling, the 14th June 1899, from E. W. Collin, Esq., Officiating Secretary to the Government of Bengal, to the Secretary to the Indian Plague Commission.

Sir,

I am directed to acknowledge the receipt of your letter, No. 905, dated the 22nd March 1899, requesting that the Commission might be favoured with information as to the manner in which the plague measures prescribed for Calcutta by the Resolution of Government, No. 1145 Medical, dated the 24th February 1899, have worked in the city.

2. In reply, I am to forward copies of letters from the Chairman of the Calcutta Corporation, No. 90 P.S., dated the 13th May 1899, enclosing copies of reports from the Health Officer of Calcutta, with information as to the results of the measures adopted up to the 31st March and up to the 30th April 1899. I am to express the regret of the Lieutenant-Governor that the repsrts have been so much delayed. As they contain no information later than the 30th April, I am to supplement them with such information as is available from the reports which have been since received from the Health Officer.

3. I am, in the first place, to describe briefly, the measures of this Government to meet the outbreak of plague in Calcutta. The measures taken in 1898 did not include the enforced segregation of the sick and contacts in camps, such as those of Bombay and Karachi, for the reason that Calcutta is so closely surrounded by swamps that the area necessary for segregation, had plague assumed large proportions, was not to be found during the rains, and the rains were close at hand when plague made its appearance. The people were, however, encouraged and assisted in opening hospitals in every ward, where the sick would be under the treatment of their own doctors, and inoculation was helped forward as far as in the attitude of the people was possible. When plague reappeared in 1899, the Government had the advantage of further experiences. One was that even in the best hospitals little could be done to save the sick; the other was, that the sick, as a rule, would not go even to their own private or ward hospitals, and that every possible device was resorted to in order to avoid discovery of the disease. The plan, therefore, was tried of leaving the sick, if they preferred it, in their houses. It was hoped thereby to obtain franker and quicker information of plague attacks, and reliance was placed on better disinfection to prevent the spread of the disease.

4. The questions, therefore, for consideration are, how far these measures prevented or lessened the concealment of plague cases, and how far disinfection was successful in preventing the spread of the disease.

5. As to the first point, the following table shows the weekly mortality from the week ending the 4th March to the week ending the 27th May. Comparison is made with the average mortality of the last five years, and the number of plague attacks and deaths is given for each week:—

Week ending—	Average Mortality.	Total Mortality.	Difference.	Reported Plague Deaths.	Reported Plague Attacks.
1.	2.	3.	4.	5.	6.
4th March	490	577	+ 87	23	30
11th „	508	611	+103	66	83
19th „	538	778	+240	120	130
25th „	565	698	+133	138	154
1st April	570	727	+157	115	125
8th „	566	706	+140	151	167
15th „	536	610	+ 74	118	120
22nd „	514	548	+ 34	83	98
29th „	506	614	+108	107	117
6th May	438	487	+ 49	62	69
13th „	420	402	— 18	52	54
20th „	420	354	— 66	28	33
27th „	420	396	— 24	33	33

Note.—The figures for the last four weeks of this table are subject to correction on receiving full statistics from the Health Officer.

This table shows that in the early part of March, the excess of mortality during the present year over the quinquennial average was not accounted for by the number of deaths from plague. From the latter half of the month, however, there is a material change in the figures. It is true that the ordinary death-rate has been lower than usual, owing to the absence of cholera, small-pox or other epidemics, but with every allowance for the freedom of the city from other forms of epidemic disease, there is evidence in these statistics that from the end of March, at least, there can have been no serious concealment of deaths from plague. The figures, therefore, support the statement of the Health Officers in their replies to Question III. in the first

report enclosed herewith, that during the early part of March cases were concealed, but that, later on, the cases were notified more freely. This statement is further confirmed in the second report of the Health Officer, at least, so far as reports of deaths were concerned. The evidence on this subject would be still clearer if reports of suspected cases of plague were included in the foregoing table. It will be observed that in the statements attached to the reports of the Health Officer, there is a column for the number of suspicious cases not definitely diagnosed as plague. From the column of remarks to those statements, it will be seen that a number of these cases were reported to Government, and Government, in preparing their statistics of plague, included the cases reported as suspected with the cases reported as real. It was understood that the only difference between the two classes of cases was, that the real cases had been seen before death or the disposal of the body, while in the suspected cases the Health Officer relied upon their inquiries as to the symptoms of the disease. If these suspected cases are included in the statistics of plague, the evidence of improvement in ascertaining cases of the disease will be still more striking, as may be seen from the following table:—

Week ending—	Average Mortality.	Total Mortality.	Difference.	Reported Deaths from Plague including suspected Cases.	Reported Attacks including suspected Cases.
1.	2.	3.	4.	5.	6.
11th March	508	611	+103	116	126
18th „	538	778	+240	219	237
25th „	565	698	+133	180	196
1st April	570	727	+157	248	265
8th „	560	706	+140	266	276
15th „	536	610	+ 74	204	218
22nd „	514	548	− 34	117	138
29th „	506	614	+108	114	120
6th May	438	487	+ 49	62	69
13th „	420	402	− 18	52	54
20th „	420	354	− 66	28	33
27th „	420	396	− 24	33	33

NOTE.—The figures for the last four weeks are subject to verification.

This table shows clearly that from the 25th March the excess of mortality, which might be due to plague, was more than accounted for by the number of plague cases, real or suspected, and it is to be inferred that there was less concealment as the people became better acquainted with the policy of Government in regard to plague precautions. Further, as regards plague attacks, there is also evidence that during the months of April and May there has been no general concealment. During these months there were 691 attacks and 634 deaths. The percentage of deaths is 92. In 1898 there were 135 cases of plague treated in the public hospitals of Calcutta. Of these, 116 died, giving a percentage of 86. There is some ground, the Lieutenant-Governor thinks, in these figures for the opinion that during the past two months there has been little concealment. The actual mortality from plague is known with a fair approximation to accuracy; from the known ratio of mortality in plague it is probable that the attacks were not greatly more numerous than those reported in the returns. With regard to the remark of the Chairman in his letter of the 19th May that plague might increase from the end of May, I am to say that the anticipation has not been fulfilled.

6. It has been stated above that entire reliance was necessarily placed on the prompt disinfection of infected premises in order to prevent the spread of the disease. The number and promptness of disinfections depend, of course, on the readiness with which plague attacks or deaths are reported or ascertained, but from the outset the endeavour was made to prepare carefully instructed disinfection-gangs in sufficient numbers to meet any probable expansion of the epidemic, and the people were asked everywhere to co-operate, in their own interests, in measures which did not disturb the sick and yet were essential to the protection of the patients' neighbours. The number of disinfections is shown in column 12 of the statements accompanying the report of the Health Officer as follows:—

Week ending—	Attacks.	Suspicious Cases.	Total.	Premises disinfected.
1.	2.	3.	4.	5.
4th March -	30	178	208	183
11th „ -	83	223	306	293
18th „ -	130	236	366	345
25th „ -	134	156	310	464
1st April -	124	179	304	355
8th „ -	167	112	279	381
15th „ -	120	134	254	316
22nd „ -	98	61	159	296
29th „ -	117	61	178	372

It may be noted here that the decrease in the number of suspicious cases in proportion to the number of real attacks shown in the above statement is further testimony to the non-concealment of cases. It will be seen from the above table that the proportion of disinfections to plague cases, real or suspected, has increased towards the end of the period under report, and that during the later period the number of disinfections exceeded the number of attacks. This is due partly to the greater readiness with which plague cases were reported, and partly to the fact that, in many cases of death from fever, the houses were disinfected at the request of the occupants.

7. The reports of the Health Officers show that few cases have come to light in which there has been a recurrence of the disease after disinfection. Dr. Hossack makes the remarkable statement that he knows of only one case of recurrence, where the whole house has been disinfected. In the beginning of April, the Lieutenant-Governor had the records examined in the wards in which plague had been most prevalent. It appeared that in Ward No. 5, for example, 57 houses had been attacked, in 12 of which plague had apparently recurred. Most of these "houses" turned out to be groups of huts with a single street number, or large houses in which only some of the rooms had been disinfected.

It may be admitted that the plan of treating plague patients in their rooms to some extent interfered with the complete disinfection of the premises. On the other hand, the absence of compulsory segregation has encouraged the people to report cases of plague or of illness resembling plague, and this has brought about a larger number of disinfections than would have been possible if the cases had been concealed.

8. With regard to the promptness of disinfection, special stress was laid upon the necessity of disinfecting on the same day as that of report. There were many delays at first owing to the concealment of cases, discovered only by examination of the registers at burning ghats or by other means. The result was that in the earlier period under report, little more than 50 per cent. of the cases were disinfected on the day of death. In the first week of May, on the other hand, out of 79 cases, 60 were disinfected on the date of death. The change was wholly due to the more prompt reports received of deaths from plague; and from the time when, thanks to these reports, disinfection became immediate, the epidemic began to abate. It does not follow that the one was a consequence of the other, but at least there is some evidence that in cities such as Calcutta, where the people are strongly opposed to the removal of the sick to hospital, the plan of disinfection, if prompt and thorough, is not unsuccessful.

9. On the other hand, in country places, where the people are accustomed to turn out under the trees, they do turn out without hesitation, and the other plan of compulsory segregation has been still more useful. In Circular No. 1 $\frac{\text{Medical}}{\text{Plague}}$, dated 14th March 1899, instructions were given that in the larger towns, should plague appear, the procedure arranged for in Calcutta was to be adopted; in villages the plan of segregation was to be followed; and in the intermediate towns the one system or the other, according to the character of the town and the attitude of the townspeople, the essential matter being to carry the people in the measures adopted for their protection. Copies of this circular are enclosed.

10. There are fifteen districts in the Province into which plague has spread from Calcutta. According to

the latest returns, the number of cases and deaths in each is given in the following table:—

District. 1.	Seizures. 2.	Deaths. 3.	Remarks. 4.
Howrah	140	87	14 of them in May; last case 26th May.
Hooghly	22	17	Only 1 in May.
Twenty-four Parganas.	109	89	Ditto.
Nadia	2	2	In March; none since.
Khulna	1	1	In April; none since.
Dacca	63	57	None since 8th April.
Faridpur	22	30	In March; none since.
Darbhanga	48	43	None since 15th April.
Saran	105	90	None since 28th April. Last death 29th April.
Patna	2	2	In March; none since.
Muzaffarpur	2	2	1 in March, 1 in April; last case 12th April.
Singhbuhum	1	1	In April.
Tippera	6	5	In March; none since.
Balasore	6	4	In April; none since 23rd April.
Sonthal Parganas	1	1	4th April.

11. The disease has thus been apparently eradicated from every district of the interior except Howrah, where it still lingers in the town of Howrah itself.

Accounts have been given of these outbreaks in the fortnightly narratives, copies of which have been forwarded to the Commission, and for convenience of reference brief notes regarding the measures taken in the above districts are attached to this letter.

IV.—APPENDIX.

NOTES of PLAGUE OUTBREAKS in some of the DISTRICTS of BENGAL in 1899.

Howrah.—The cases have been confined almost exclusively to the municipality, where the same measures were adopted as prescribed for Calcutta.

Hooghly.—The cases occurred in municipal areas as Serampur, Bhadreswar, and Chinsurah. The cases were imported from Calcutta, and were treated as prescribed for that city. There have been no cases since the 5th May.

Twenty-four Parganas.—The majority of cases occurred in the municipality of Cossipore-Chitpur immediately adjoining Calcutta. The same measures were adopted as in Calcutta. The cases ceased on the 26th April. There were three outbreaks in the rural areas, which were stamped out by isolation and disinfection. They were imported from Calcutta. No cases occurred after the month of April, except an isolated one on 3rd May.

Nadia.—During the fortnight ending 1st April 1899, one case, which ended in death, occurred in the town of Krishnagar. The whole block of houses was disinfected and the members of the family segregated in a separate house. One death from plague, imported from Calcutta, occurred at Porandanga in the subdivision of Ranaghat. Here the thatch of the house was removed, the house disinfected, and the members of the household segregated in temporary huts. In both instances the measures taken were successful, and no further cases have occurred.

Dacca.—Plague was introduced from Calcutta on the 12th February 1899. Between the 15th February and 3rd March, nine other persons who were infected by contact died of plague. The disease was carried by the medical man to a neighbouring village. He died on the 23rd February, and between the 24th and 27th there were six other attacks in his house, five of which ended fatally. There were outbreaks in two other villages, introduced from Calcutta. The one lasted from the 19th March to the 13th April, and there were 17 cases and 13 deaths. In the other case two men recently arrived from Calcutta died on the 27th and 31st March, but the disease did not spread. The houses where the cases occurred were disinfected. The huts were so close together that it was not possible to burn them down without danger to other houses. Reliance was therefore placed on thorough disinfection and the opening out of mat walls, coupled with the burning of the bedding, &c.

Faridpur. — Plague was introduced by a traveller from Calcutta on 17th February. Twenty-two persons were attacked, all of whom died. The last case was on the 13th March. The disease also spread to a neighbouring village, where 10 persons were attacked and eight died. The last death was on the 15th March. The preventive measures taken were the burning of the huts and all contents, the disinfection of neighbouring huts, and the segregation of all contacts and members of the family.

Saran.—In Saran plague was introduced by an Ahir who came from Calcutta and died of plague in the village of Khutuha on 22nd January. This was not recognised as plague at the time, and was reported as being due to fever. The next suspicious death in the village did not occur till January 29th. After this there was one case, on February 12th, but deaths did not become frequent till the end of February, and it was not till March 15th that the local authorities heard of the outbreak and visited the village. Altogether up to 1st April 1899, 86 cases occurred in the village of Khutuha, 72 of which ended in death, four recovered and ten were pending at the end of the month. In the latter half of April two new cases occurred in this village due to infection from the adjacent village of Abdulhai. They recovered, and there was no case in the village from the 28th April. In the adjacent village of Abdulhai, five cases occurred and three deaths in March and 12 cases and five deaths in April. No case occurred after 27th April. Plague was introduced from Khutuha. The measures adopted to prevent the disease from spreading were the evacuation of infected houses and, later on, of the sections of the village in which plague occurred, the segregation of the sick and their attendants in camps, the destruction of the clothes, bedding, and effects of the sick and of those who had been in contact with them, and the burning of houses when this could be done without danger; where the last-mentioned method was impossible, houses were unroofed and thoroughly disinfected. All the families in which cases had occurred were removed to a segregation camp, and all contacts were disinfected. The entire hamlet was thoroughly disinfected, as well as two other sections of the village Khutuha, where dead rats were found, but where no definite case of plague occurred, the inhabitants being removed to huts in a mango grove near. Liberal compensation was paid in all cases. The people, who were Hindus, behaved well and gave every assistance in their power. The plague was of the pneumonic type. Appliances for inoculation were supplied, but arrived after the worst was over, and no one was willing to be inoculated.

Both these villages were kept in quarantine, and two persons were punished for breaking quarantine rules.

Darbhanga.—Plague was introduced into the village of Jhalwara by two Muhammadans, who arrived from Calcutta on March 7th, one of whom died on March 10th. The Magistrate received information from the proprietor of the village on March 15th. By the end of the month there were 46 seizures and 43 deaths. Two cases were reported on the 1st April but they recovered; since that date there have been no cases. The same measures were adopted as in Saran. The villagers, who were low-class Muhammadans, at first refused to carry out any measures of protection, and a cordon of police was placed round the village. After 24 hours the people changed their attitude and gave no more trouble.

In the village of Narchak a person who returned ill from Calcutta on the 8th or 9th April was examined by the Civil Surgeon and found to be suffering from plague. He died on the 15th. In this village the villagers themselves segregated all persons who had lately returned from Calcutta, and no other case had occurred.

Patna.—On 8th March, a Hindu, who appears to have left Calcutta while actually suffering from plague, arrived and died in Patna city on 10th March. Prompt information was given, the family were isolated in their dwelling, the buildings were disinfected and also

the clothes of the contacts. No further case has occurred. On 24th March a man died of plague in the town of Bihar, after leaving Calcutta on the 14th. Information was received early, and the relatives were segregated in houses which the neighbours vacated for them. No further case has occurred.

Muzaffarpur.—A Muhammadan from Calcutta arrived in Hajipur town shortly before 26th March 1899, where he died of plague. Immediate intimation was given, and precautions as in the cases of Saran, Darbhanga, and Patna were taken, the relatives in this instance being segregated in a mango tope. No other case occurred. Two Chamars arrived from Calcutta at the village of Mathura on the 11th April and one died on the 12th from what was suspected to be plague. The Chamars lived in a grove of trees outside the village and were probably compelled to do so by the villagers. The body and its clothing and also a hut where it was thought the deceased had stayed were burnt and the contacts segregated. No other case occurred.

Sonthal Parganas. — In the fortnight ending 1st April one imported case of plague occurred in Deoghur in the Sonthal Parganas, which ended in death. The members of the family were segregated, and no further case has occurred.

Tippera and Balasore.—There is nothing special in these cases.

Singhbhum. — A Marwari left Chaibassa in the Singhbhum district and stayed in Calcutta two days and returned to Chaibassa on the 10th April 1899, where after two days' illness he died of plague. He was segregated while ill and the contacts isolated. His bedding and furniture were burnt and the roof of the house removed. No other case occurred.

V.—Letter No. 90 P.S., dated Calcutta, the 13th May 1899, from W. R. BRIGHT, Esq., Chairman of the Corporation of Calcutta, to the SECRETARY TO THE PLAGUE COMMISSION, Bengal.

SIR,

I HAVE the honour to forward a report from Major Green, I.M.S., the Special Health Officer, in reply to your No. 6009, dated the 8th April.

The report is an interesting one in itself, and I have little to add to it.

At first sight it would appear that the entire absence of compulsory removal to hospital required explanation, but this is really not so, as the Government Resolution No. 1,145 Mdl., dated the 24th February 1899, has expressly ruled that we are not to remove patients compulsorily, but are to leave them in their houses making such arrangements as we can.

It is on this account that we have not removed any one to hospital against their will. The results of this policy seem, so far as the experience of this year's epidemic goes, to have been successful. Although the town has at one time or another been apparently infected throughout its length and breadth, the lenient policy now adopted has certainly not led to a bad epidemic, and the disease at present is in a fairly quiescent state. On the other hand, the policy has led to an absence of panic and scare, and the exodus of people, even at the worst time of the epidemic, has been hardly noticeable. There has thus been hardly any dislocation of trade, and the attitude of the people generally has been markedly non-hostile, though at first especially there was great disinclination to report cases. Even now, though the concealment is less, people are still rather averse to reporting, because they do not want to be bothered with disinfection.

The fact that we have not had a bad epidemic has, I confess, surprised me. The plague was certainly of a bad type, and when it got to places outside Calcutta, it seems to have been very virulent. The only explanation possible seems to be that, at present and for some unknown reason, the people of Calcutta are in some way and to a great extent immune from the disease. Whether this immunity will continue is a matter of doubt, but the experience of this outbreak certainly seems to point to Calcutta being at present an unfavourable nidus for the disease. I do not propose to go at length into the different points on the report. A few remarks, however, seem to be necessary.

Question III (*c*).—The relation between the total mortality and the average mortality—

In drawing any conclusions on the subject it must be remembered that there has been singularly little small-pox or cholera, and that allowance should be made for this in comparing the actual mortality with the quinquennial averages.

Question IV.—The apparent success of disinfection is very remarkable—

One curious point which has been observed in this epidemic is that the prostitute class, which appeared to be fairly immune in Bombay, has by no means enjoyed the same immunity here.

The delay in replying to your letter, which I regret, has been due to the fact that we had to compile the information required, and this has been a somewhat laborious task.

VI.—Letter No. 462 P.—S.R., dated Calcutta, the 10th May 1899, from Major C. R. M. GREEN, I.M.S., Special Health Officer, to the CHAIRMAN TO THE CORPORATION, Calcutta.

SIR,

I HAVE the honour to forward herewith a report on the points called for by the Indian Plague Commission, dated 22nd March, and received by me on 24th April 1899—

QUESTION I.

The number of persons sent to hospital—

(*a*) *Voluntarily* was 87.

(*b*) *Against their wishes*, on the ground that suitable arrangements could not be made at home = 0.

QUESTION II.

The number of cases left for treatment in their houses—

(*a*) *On the ground that they were moribund* = Two in District I., South. The Medical Officer of District I., North, reports none. District II. "no record," District III. none.

(*b*) *On the ground that suitable arrangements had been made for their treatment at home* = 13 in all, viz.—

12 in District No. I., South.
1 in District III.

Dr. Mahoney in District I., North, gives 127 cases as left for treatment, but states: "I do not consider that "any of these cases was left in a suitable place for "treatment."

Dr. Hossack, District No. I., South, gives 30, although the arrangements were unsuitable.

Dr. Justice, District IV., states that 40 cases were left for treatment in their own houses. In no case was suitable arrangement made for isolation or proper treatment at home. In each case the relatives refused, although urged to do so, to remove the patient to hospital.

In 204 out of 501 cases nothing was known of the arrangements, as investigation was only made after death, the existence of the cases having been concealed.

QUESTION III.

The effect of the measures on the concealment of plague illustrated by—

(*a*) *The amount of plague sickness reported.*—Dr. Mahoney, D.M.O., District I., North, reports that "concealment was much more prevalent in the early "part of the outbreak than it is at present," and I myself think so also.

Dr. Hossack, D.M.O., District I., South, says:—"The fact that 72 per cent. of the cases were discovered "only after death shows that the effect of the measures "in reducing concealment has been less than might "have been expected. This has been particularly so "with the ignorant and uneducated. There has been "a gratifying tendency, however, on the part of the "upper classes and the doctors to notify cases more "freely and to accept the necessary measures in a good "spirit."

On several occasions a spontaneous request has been made that "the Municipal doctor should come and see "the patient and give his opinion, showing that the "horror in which he was held is passing away."

Dr. Pearse, of District III., reports that out of 113 deaths attributed to plague, we only saw 11 living cases. All the rest were discovered by investigations after death, *i.e.*, chiefly from enquiries ordered by me on inspecting the death reports from the burning ghats.

(b) *The proportion of males and females who were attacked and died of plague.*—During the period under report, out of 501 attacks and 443 deaths, 149 attacks and 130 deaths were among females, giving 29·74 per cent. and 29·34 per cent. respectively. The normal proportion of females in Calcutta is 234,362 against 415,039 males, that is, a percentage of 33·3 females and 66·6 males.

The proportion of females that came under observation in living cases in District I., South, is stated by Dr. Hossack to have been 27·7 per cent., so that there has been no concealment especially of female cases, and the number of cases amongst females was more than those amongst men proportionally.

Although the death rate has been in excess of the normal, the number of plague cases and cases looked on as suspicious (treated as if they were plague deaths) more than compensate for the difference. I do not think there has been plague in excess of these combined numbers.

(c) *The relation between the total mortality and the average mortality in past years.*—I attach copies of our weekly returns for the period. Thus for the week ending 4th March, the deaths were 87 in excess of the five-yearly average. Twenty-three plague deaths were reported and 178 were thought to be suspicious. In the week ending 11th March there were 103 deaths in excess of the five-yearly average, 68 deaths were due to plague, and 223 were looked on as suspicious. In the week ending 18th March there were 20 deaths in excess of the five-yearly average; there were 120 plague deaths, and 236 were thought to be suspicious. In the week ending 25th March there were 133 deaths in excess of the five-yearly average; there were 138 plague deaths and 156 suspicious cases. In the week ending 1st April there were 157 deaths in excess, 115 plague deaths and 174 suspicious. I would call attention to the large number of disinfections done in proportion to the number of plague cases reported.

Question IV.

The effect of treatment of patients at home on the spread of the disease:—

(a.) *On the other residents.*
(b.) *In the neighbourhood.*

It is difficult to separate these questions, as bustee huts communicate so with one another that the distinction between a room and a separate house is not marked.

I am of opinion that the results of the present measures do not suggest that they have tended in any way to cause the spread of plague; in fact, the indications are the other way. Although we still hear of cases chiefly through the death reports, I am of opinion that with more stringent measures there would have been a far more systematic suppression of cases by disposing of the dead anyhow, and by giving false information. As well, there would have been an active opposition to disinfection and to moving patients, and although a few more cases would have been able to be shown as "died in hospital," the disinfection of places where plague patients had died and their vacation would have been less, and the probability of disease spreading greater, not taking into account the scare and dislocation of trade that would have been caused and the race animosities aroused. I would here point out that disinfection is not confined to plague cases, but is performed after nearly every death from fever. After death has taken place, the fact that a death has occurred is willingly volunteered, and disinfection is even sought for by the neighbours. I give here an extract from a disinfection report to Government:—"I beg to report that all the places in which "successive deaths have been reported are not single "houses but bustees. It is a fact that there are huts "and houses which show a succession of deaths, but "these have occurred previous to investigation and "disinfection, or else may be explained by the fact "that the people who afterwards fell ill were, at the "time, infected."

Dr. Hossack states:—"I know of only one case of "recurrence where the whole house has been disin-"fected, viz., 137, Cotton Street." There were four deaths at intervals here, and after each case, the room where deceased was, the passages, &c., were disinfected. There was another case (the fifth) three weeks after the last death. In this house, to my certain knowledge, a room in which the fourth case died was not disinfected, another empty room being pointed out at the time. Infected bedding was also retained, for which obstruction we got a conviction in the Police Court. This practice of showing the wrong room as the place where deceased lived is not uncommon, and unless the whole house is disinfected, cannot be guarded against.

Dr. Hossack, Dr. Justice, and Dr. Lloyd, all concur that they know of no case occurring in the same room after disinfection. Such a case was reported to me as having occurred in Shambhu Nath Mullick's Lane, but I found on inquiry that the room was pointed out, as it was empty (having been disinfected), in order to save another room disinfected. The two deaths prior to disinfection have occurred several times — for instance, at 374, Upper Chitpore Road.

On this point, in District No. 1, South, where there has been most plague, Dr. Hossack reports:—"It has "been shown that 86 per cent. of the cases were "treated under conditions favourable to the spread of "plague. Nevertheless, it has not spread to any "alarming extent, and even in huts and houses, with "a population ranging from 30 to 100, it has been "quite exceptional to find more than two or three "deaths in the house. Again, people remove from an "infected house or bustee, perhaps more than once, "and though a fresh case or two may develop in their "new quarters, they rarely tend to start a new "outbreak amongst the population amongst whom "they have settled. The only possible explanation of "this is, that Calcutta people offer a resistance to "infection. This is also borne out by the large "proportion of recent arrivals in Calcutta, amongst "those who have succumbed. Infection is present, "rats are dying, but nothing seems to happen till a "new arrival comes from the mufassal, and within "ten days or a fortnight he succumbs."

(a.) *Effect on other residents.*—As a rule they are not attacked, or if they are, it is at an interval of a week or two after the previous case. There have been, however, some marked examples to the contrary, as follows:—

(1.) 150-*H.*, *Baranashi Ghose's Street, Bustee Hut.*—Within seven days from 9th March 1899 there were five fatal attacks. The hut was then evacuated. The survivors moved to No. 7, Juggo Mohan Saha's Lane. Three days later Kanai died; he had been removed while suffering from plague. Three days later again Dukhee died. No case occurred amongst the other previous inhabitants of the house. The survivors allowed themselves to be segregated for ten days, and then removed to No. 1, Sri Nath Roy's Lane. Then Juggo was attacked on 14th April 1899, and died there on 18th April 1899. No outbreak occurred in the house. At present no one will take in the survivors, and they are living in the plague camp. Thus, there have been eight deaths out of about fifteen people.

(2) 374-*H.*, *Upper Chitpur Road, Bustee.*—In one two-storied hut, 11 people died in a week, four of these died in one room, being members of one family. There were five other deaths in adjacent huts in the same time. Only the last two or three cases were removed to hospital.

(3) 12-*H.*, *Karformah's Lane.*—Five people got ill within ten days. Of these, two recovered. Two-storied hut; lower storey used as cow-shed. None taken to hospital.

(b) *Effect on neighbourhood.*—Plague undoubtedly hangs about the neighbourhood. Whether this is due to leaving patients at home may be doubted. On the one hand, disinfection is impossible as long as cases are being treated in a house. On the other hand, I have noticed dead rats in a neighbourhood for some time before the cases began to occur, notably in Rambagan, Beadon Street, and Manicktolla Street. It seems more likely that the subsequent cases are due to primary infection of the neighbourhood than to the secondary infection from the early cases.

Dr. Pearse, of District III., says:—"The few cases "which might probably be put down to having been "'caught' are nothing compared with the large num-"ber of 'contacts.'" The inference is, that there is very little danger in allowing plague patients to remain in their own houses.

Dr. Justice is of a contrary opinion; but if measures of compulsory removal and segregation had been carried out, I do not think the results would have been different, for the cases would not have been heard of.

He says:—"The effect of treatment of the patients "in their houses on the spread of the disease was "generally, that other inmates in the hut were "infected. Having once found a case in a house, we "generally found another in the neighbourhood. The

" people in the adjoining hut were the next victims. " The disease in this district has so far confined itself " to limited areas. Cases occurring outside these " areas can, most of them be traced to some intercourse " with the effected area. Funerals are powerful factors " in spreading the disease amongst the neighbours."

QUESTION V.

The effect on the spread of the disease of the removal of the inmates from an infected house other than those in attendance on a patient to another locality. — The Sanitary Commissioner, Bengal, has given me the following list of places where the first patient was found to have come from Calcutta, and the number of plague deaths resulting from the importation. Considering how widespread the cases are, it is a matter for surprise that the disease has not spread more. In a rural area epidemic disease is doubtless more easily stamped out:—

TABLE showing the number of PLAGUE CASES occurring out of CALCUTTA since 24th February 1899, which have been said to be due to importation from CALCUTTA.

No.	Name of District out of Calcutta.	Plague Deaths.
1.	2.	3.
1	Birbhum	1
2	Bankura	1
3	Hooghly	15
4	Serampore	5
5	Twenty-four Parganas	3
6	Nadia	2
7	Khulna	1
8	Dacca	16
9	Faridpur	28
10	Patna	2
11	Saran	3
12	Muzaffarpur	2
13	Darbhanga	2
14	Sonthal Parganas	1
15	Balasore	3
16	Singhbhum	2

C. R. M. GREEN, Major, I.M.S.,
F.R.C.S. (Eng.), D.P.H. (Camb.),
Special Health Officer.

VII.—Letter No. 6,395, dated Calcutta, the 2nd June 1899, from R. W. CARLYLE, Esq., Secretary to the Plague Commission, Bengal, to the SECRETARY TO THE GOVERNMENT OF BENGAL, Municipal Department.

SIR,

IN continuation of this office No. 6,319, dated the 16th May 1899, I am directed to submit, for transmission to the Indian Plague Commission, in original, a letter, No. P./S. 92, dated the 19th May 1899, from the Chairman of the Corporation of Calcutta, and its enclosures, furnishing particulars regarding plague operations in the city of Calcutta for the month of April 1899.

If the report is printed, I am to request that this office may be supplied with 25 spare copies for circulation among the members and for record in this office.

VIII.—Letter No. P./S. 92, dated Calcutta, the 19th May 1899, from W. R. BRIGHT, Esq., Chairman of the Corporation of Calcutta, to the SECRETARY TO THE BENGAL PLAGUE COMMISSION.

I BEG to forward, in original, the report of plague operations in this city for the month of April.

I have little or nothing to add to the remarks which I made last week when forwarding a similar report for the month of March.

I confess the fall of the disease surprised me, and from its spread during April, I certainly feared that we were in for a rather severe epidemic. On comparing the chart attached to Dr. Cook's report* on last year's plague with the chart of this year's epidemic, a very curious coincidence is observable. Last year the disease began on the week 10th to 16th April, and in the next week up but one, it shot up to the highest point it ever reached, *i.e.*, 29 seizures and 22 deaths during the week. This year in the corresponding week it made a corresponding shoot, reaching a maximum of 27 cases and 24 deaths reported on one day. From that week last year, the disease declined until it reached its lowest point on the week from 15th to 21st May, and this is exactly what it seems to be doing this year. It remains to be seen whether the close similarity observable so far will continue, and whether the epidemic will again gather strength and rise until the end of June, and then fall again, but the similarity is sufficiently curious to make it worthy of remark.

* *See* Appendix No. XX. in Vol. I. of these Proceedings.

IX.—Letter No. P./S.R. 485, dated Calcutta, the 17th May 1899, from Major C. R. M. GREEN, I.M.S., Special Health Officer, to the CHAIRMAN TO THE CORPORATION OF CALCUTTA.

I HAVE the honour to submit herewith the information asked for in the Indian Plague Commission's No. 905 of 1899, for the month of April, in continuation of my report up to 31st March.

QUESTION I.

The number of persons sent to hospital:—

(*a.*) *Voluntarily* was 89.

(*b.*) *Against their wishes on the ground that suitable arrangements could not be made at home* = 1. This case was in District IV. He had no one to look after him, and was sent by Dr. Justice to the Budge-Budge Road Hospital.

QUESTION II.

The number of cases left for treatment in their houses:—

(*a.*) *On the ground that they were moribund* = 3.

(*b.*) *On the ground that suitable arrangements had been made for their treatment at home* = 5. In 377 cases the arrangements are unknown, as they were not reported during life.

In 65 cases the arrangements were not suitable, but they objected to go to hospital, their friends objecting also to their being sent. They were visited daily and treated when they desired it.

QUESTION III.

The effect of the measures on the concealment of plague illustrated by the amount of plague sickness reported.— The remarks in my last report still hold good. Dr. Pettifer says plague deaths are still being registered as due to other causes.

The fact that 163 out of 540 cases were reported before death, or only 30 per cent. does not show any improvement in reporting sickness. There is an improvement, however, in reporting deaths.

(*b.*) *The proportion of males and females who were attacked and died of plague.*—Out of 540 cases and 499 deaths, there were 157 females attacked with plague and 139 deaths, that is, 29 in every 100 cases were females, and 28 out of 100 deaths; of the living cases that came under Dr. Hossack's observation 21·5 per cent. were females. As I stated last month, the normal percentage of men and women in Calcutta is 66·6 men and 33·8 women, respectively, according to the census of 1891.

I do not think this percentage of plague amongst women shows concealment.

(*c.*) *The relation between the total mortality and the average mortality in past years.*—I attach copies of the weekly returns for the four weeks ending 29th April.

The mortality was 356 in excess of the preceding five years, and 459 deaths from plague are shown. So that deducting plague, the general mortality was below normal. The deaths from cholera and small-pox during this period were, however, 518 below the average. So that 356 does not probably represent the total amount of plague, although, when deducted, it reduces the mortality below the normal; still, there cannot have been great concealment. We thought 366 other deaths might have been due to plague and disinfected and shut up the habitations accordingly. No doubt all these 366 deaths were not due to plague.

QUESTION IV.

The effect of treatment of patients at home on the spread of disease:—

(a.) *On the other residents.*

(b.) *In the neighbourhood.*

I have little to add to the reply given in the last report. No case of its spreading among the inmates after a hut has been disinfected has come to my knowledge. Several cases have occurred in huts in juxtaposition, and several deaths have occurred in the same building before our getting information about them. For instance, nine cases occurred between April 1st and 4th within six huts in a bustee at 33, Shampuker Street. On getting information, the huts were disinfected and vacated. No cases have since occurred there or in the immediate neighbourhood. Since the week ending April 8th, there has been a decrease in plague and a fall in the general mortality, excepting for slight rise in the week ending April 29th.

The measures, carried out in this city, are, therefore, satisfactory.

QUESTION V.

The effect on the spread of the disease of the removal of the inmates from an infected house, other than those in attendance on a patient, to another locality.—Two plague patients were removed by friends to Howrah. On hearing of it, I gave information to the authorities there, and one case was found. He died. I have not heard of its causing more disease there.

Dr. Pettifer reports "of the contacts in the huts at "33, Shampuker Street, about 30 in number, two are "said to have died of plague. One on a steamer going "to Cuttack and one at Serampur." I have received no reports of the disease spreading from these cases.

Since the appointment of medical examiners at the railway stations by the Bengal Government, I have received no report of plague being spread in the districts round Calcutta, through infected people leaving Calcutta.

CITY OF CALCUTTA.

RETURN showing Information regarding PLAGUE under the following Headings for the Week ending 8th April 1899.

Division.	Population by Census of 1891.	Average Weekly Mortality.	Actual Mortality for the Week.	Number of Plague Cases Discovered.			Number of Patients removed to Hospitals.	Suspicious Cases not Definitely Diagnosed as Plague.	Number of Persons under Observation in Private Quarters.	Houses Inspected and Deaths Inquired into.		Premises Disinfected.	Premises Vacated.	Remarks.
				Attacks.	Deaths.	Total.				Houses.	Deaths.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.	13.	14.
Address uncertain	—	—	—	4	1	—	4	—	—	—	—	—	—	
District I., North—														
Ward No. 1	36,885	35	43	21	22	—	—	5	—	79	35	77	3	
Do. 2	26,614	25	25	8	8	—	—	10	—	31	25	30	2	
Do. 3	36,431	31	54	13	15	—	—	14	—	73	37	82	2	
District I., South—														
Ward No. 4	34,828	36	34	11	11	—	—	7	—	17	30	36	5	
Do. 5	39,180	42	43	15	12	—	—	4	—	24	36	20	12	
Do. 6	41,657	43	54	26	22	—	1	2	—	29	42	51	4	
District II.—														
Ward No. 7	20,646	18	36	11	7	—	—	8	283	27	27	22	11	
Do. 8	50,781	49	64	2	4	—	1	10	134	26	26	13	6	Though the actual number of plague cases and deaths is the highest that has yet been recorded in any one week, the general mortality from all causes, which, in the absence of any other special cause, is the most reliable index of the plague mortality, is slightly less than it was in the preceding week, and has not increased during the last four weeks. The decrease in the mortality, however, be due to the population being diminished by the slight exodus that has taken place.
Do. 9	49,472	45	57	1	1	—	—	11	88	44	44	13	5	
Do. 10	22,668	25	23	2	2	—	2	2	57	19	19	5	2	
Do. 11	20,761	16	29	6	4	—	4	9	60	14	14	9	1	
District III.—														
Ward No. 12	6,083	4	1	—	—	—	—	—	—	1	1	—	—	
Do. 13	28,366	16	25	7	6	—	3	5	27	15	15	11	—	
Do. 14	29,207	27	29	7	7	—	—	8	46	23	23	12	—	
Do. 15	13,218	12	21	4	3	—	1	9	71	21	21	11	—	
Do. 16	4,620	2	2	—	—	—	—	—	—	—	—	—	—	
Do. 17	4,598	3	2	—	—	—	—	—	—	1	1	—	—	
Do. 19	4,820	36	21	—	1	—	—	2	8	9	9	2	—	
District IV., West—														
Ward No. 18	33,147	4	3	—	—	—	—	—	3	2	2	—	—	
Do. 23	23,020	9	10	—	—	—	—	—	—	2	2	1	—	
Do. 24	22,831	10	18	—	—	—	—	—	—	1	1	—	—	
Do. 25	42,501	15	38	7	7	—	—	4	18	24	24	12	—	
District IV., East—														
Ward No. 20	14,804	17	17	3	3	—	—	1	23	12	12	6	—	
Do. 21	15,340	18	9	—	—	—	—	—	3	2	2	1	—	
Do. 22	26,838	28	48	19	15	—	—	1	58	26	26	17	2	
Total	649,401	566	706	167	151	—	16	113	—	522	474	381	55	

J. N. COOK,
Health Officer.

RETURN showing Information regarding PLAGUE under the following Headings for the Week ending 15th April 1899.

Division.	Population by Census of 1891.	Average Weekly Mortality.	Actual Mortality for the Week.	Number of Plague Cases Discovered.			Number of Patients removed to Hospital.	Number of Suspicious Cases not Definitely Diagnosed as Plague.	Number of Persons under Observation in Private Quarters.	Houses Inspected and Deaths Inquired into.		Premises Disinfected.	Premises Vacated.	Remarks.
				Attacks.	Deaths.	Total.				Houses.	Deaths.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.		12.	13.	14.
Address uncertain -	—	—	—	3	3	—	3	1	—	—	—	—	—	There were 118 deaths from plague this week, against 151 last. The general mortality was 74 in excess, against an excess of 140 last week. So that the decrease of plague is evident. There is little doubt also but that a large proportion of the deaths we think suspicious are not due to plague. Wards 3, 7, 8, 9, 10, 14, 25, 22 show more than 5 deaths above the average. Ward 3 shows 12; Ward 8, 17; Ward 10, 15; Ward 22, 16: Ward 3, 7; and Ward 22 also shows a large number of plague cases, but Ward 10 is an exception. Wards 5 and 6 show 16 and 14 deaths from plague, although the general mortality is not high. Dr. Hossack considers it due to large exodus from those wards. C. R. M. GREEN, Major, Health Officer.
District I., North—														
Ward No. 1 -	36,885	28	33	9	9	—	1	15	—	1	26	26	—	
Do. 2 -	26,614	23	24	5	4	—	—	4	—	1	13	11	—	
Do. 3 -	36,431	36	48	10	10	—	1	17	—	1	29	28	—	
District I., South—														
Ward No. 4 -	34,828	34	19	9	6	—	2	6	—	19	25	19	19	
Do. 5 -	39,180	38	43	17	16	—	—	5	—	20	39	31	10	
Do. 6 -	41,657	39	33	12	14	—	3	5	—	18	28	19	9	
District II.—														
Ward No. 7 -	20,646	20	29	7	10	—	1	11	262	24	24	26	13	
Do. 8 -	50,781	41	58	8	8	—	2	13	136	30	30	24	10	
Do. 9 -	49,472	46	57	8	8	—	2	19	177	45	45	40	16	
Do. 10 -	22,668	19	34	—	—	—	—	4	57	12	12	11	3	
Do. 11 -	20,761	18	13	2	3	—	1	1	20	10	10	13	2	This week shows an appreciable decrease both in plague cases reported and in the total mortality, which, however, is still 74 above the average for the time of year. If, however, the deaths from plague and suspected plague be subtracted from the total (610−245), the deaths from all cases other than plague are only 362, or 32·4 per cent. below the average for the time of the year. From this it would appear that if the year is normally healthy apart from plague, and suspected cases were what they were supposed to be, the exodus that has occurred must be considerable, the population being 222,007 below the census population of 1891. J. N. COOK, Health Officer.
District III.—														
Ward No. 12 -	6,083	2	2	2	2	—	1	—	—	3	3	1	—	
Do. 13 -	28,366	19	23	3	3	—	—	8	25	14	14	9	—	
Do. 14 -	29,207	21	32	3	2	—	1	5	13	11	11	10	—	
Do. 15 -	13,218	10	11	3	3	—	1	2	11	5	5	2	—	
Do. 16 -	4,620	2	3	—	—	—	—	1	—	2	2	2	—	
Do. 17 -	4,598	3	1	—	—	—	—	1	—	1	1	—	—	
Do. 19 -	4,820	30	19	1	1	—	—	8	8	12	12	7	—	
District IV., West—														
Ward No. 18 -	33,147	4	6	—	—	—	—	—	—	—	—	—	—	
Do. 23 -	23,020	8	8	1	1	—	—	—	—	2	2	2	—	
Do. 24 -	22,831	12	6	—	—	—	—	—	5	2	2	1	—	
Do. 25 -	42,591	17	28	—	—	—	—	2	17	12	12	6	—	
District IV., East—														
Ward No. 20 -	14,804	18	18	1	1	—	—	1	4	5	5	3	—	
Do. 21 -	15,340	20	18	3	1	—	3	—	—	2	2	1	—	
Do. 22 -	26,833	28	44	13	13	—	1	5	84	25	25	22	—	
Total -	649,401	536	610	120	118	—	23	134	—	277	377	316	82	

App. B.

RETURN showing Information regarding PLAGUE under the following Headings for the Week ending 22nd April 1899.

Division.	Population by Census of 1891.	Average Weekly Mortality.	Actual Mortality for the Week.	Number of Plague Cases Discovered.			Number of Patients removed to Hospitals.	Number of Suspicious Cases not Definitely Diagnosed as Plague.	Number of Persons under Observation in Private Quarters.	Houses Inspected and Deaths Inquired into.		Premises Disinfected.	Premises Vacated.	Remarks.
				Attacks.	Deaths.	Total.				Houses.	Deaths.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Address uncertain -	—	—	—	3	—	—	2	—	—	—	—	—	—	
District I., North—														
Ward No. 1 -	36,885	32	25	3	3	—	1	12	—	58	22	25	—	
Do. 2 -	26,614	20	19	6	4	—	—	3	—	28	17	15	—	
Do. 3 -	36,431	38	35	11	9	—	1	12	—	62	33	31	—	There were 83 deaths this week from plague against 118 last week. The general mortality was only 34 in excess of the 5-yearly average. The excess has not been so small since the beginning of March, and since March 10th there have not been so few cases in one week. Wards 5 and 6 still show a disproportion between the amount of plague and the general mortality. Wards 8, 9, 10, and 25 show high death-rates, but little plague. The decrease in plague noticed last week has continued. C. R. M. GREEN, Major I.M.S., Special Health Officer.
District I., South—														
Ward No. 4 -	34,828	28	35	5	6	—	—	—	—	32	32	18	—	
Do. 5 -	39,180	33	31	8	8	—	1	—	—	39	39	17	3	
Do. 6 -	41,657	40	30	16	16	—	2	2	—	36	36	28	1	
District II.—														
Ward No. 7 -	20,646	14	16	6	5	—	2	3	110	23	23	19	11	
Do. 8 -	50,781	36	45	3	1	—	3	—	—	31	31	19	11	
Do. 9 -	49,472	47	56	3	3	—	2	4	50	49	49	31	10	
Do. 10 -	22,668	16	25	4	2	—	3	3	40	23	23	13	11	
Do. 11 -	20,761	19	15	—	—	—	—	—	—	8	8	3	—	
District III.—														
Ward No. 12 -	6,083	3	2	1	1	—	—	—	—	—	—	—	—	
Do. 13 -	28,366	18	22	6	5	—	2	3	6	10	10	14	—	
Do. 14 -	29,207	19	21	3	2	—	1	6	91	21	21	10	—	The reported cases of plague and the general mortality were both lower than in the preceding week. 2. If plague and suspected plague deaths be deducted from the total mortality, the remainder is 103 below the average of the last five years. But cholera, small-pox, fevers, and bowel-complaints together were 116 below the five years' average, which accounts for the low mortality from causes other than plague, and should have been allowed for last week in estimating the diminution in the population from the mortality. J. N. COOK, Health Officer.
Do. 15 -	13,218	9	14	—	—	—	—	2	12	10	10	6	—	
Do. 16 -	4,620	1	5	—	—	—	—	1	—	1	1	—	—	
Do. 17 -	4,598	4	2	—	—	—	—	1	4	2	2	2	—	
Do. 19 -	4,820	28	32	—	—	—	—	3	7	12	12	11	—	
District IV., West—														
Ward No. 18 -	33,147	5	2	—	—	—	—	—	—	—	—	—	—	
No. 23 -	23,020	8	7	1	—	—	—	—	3	3	3	—	—	
No. 24 -	22,831	11	11	—	—	—	—	—	17	5	5	—	—	
No. 25 -	42,591	15	27	—	1	—	—	—	36	15	15	—	—	
District IV., East—														
Ward No. 20 -	14,804	16	21	1	—	—	—	3	9	13	13	5	—	
Do. 21 -	15,340	22	9	—	—	—	—	—	9	9	9	2	—	
Do. 22 -	26,833	32	41	18	17	—	—	3	53	36	36	27	—	
Total -	649,401	514	548	98	83	—	20	61	—	526	450	296	47	

RETURN showing Information regarding PLAGUE under the following Headings for the Week ending 29th April 1899.

Division.	Population by Census of 1891.	Average Weekly Mortality.	Actual Mortality for the Week.	Number of Plague Cases Discovered.			Number of Patients removed to Hospital.	Number of Suspicious Cases not Definitely Diagnosed as Plague.	Number of Persons under Observation in Private Quarters.	Houses Inspected and Deaths Inquired into.		Premises Disinfected.	Premises Vacated.	Remarks.
				Attacks.	Deaths.	Total.				Houses.	Deaths.			
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
Address uncertain -	—	—	—	2	1	—	2	—	—	—	—	—	—	Plague, 107 deaths, against 83 last week. General mortality 108 in excess. Last week the excess was 34. Ward 3 showed 23 deaths from plague and suspect, leaving only 9 deaths from other causes, against a five-yearly average of 33.
District I., North—														
Ward No. 1 -	36,885	30	34	5	5	—	—	9	—	52	19	25	2	
Do. 2 -	26,614	19	15	3	3	—	—	4	—	25	11	12	2	
Do. 3 -	36,431	33	32	10	9	—	1	14	—	67	33	33	8	Wards 8, 9, 10, 11, 13, and 25 still show a high mortality.
District I., South—														There is apparently more plague than is reported in Wards 11, 24, and 25.
Ward No. 4 -	34,828	30	34	9	9	—	—	—	—	15	27	20	5	
Do. 5 -	39,180	33	32	7	7	—	—	—	—	15	19	18	1	There has been a slight increase in the amount of plague in the past week.
Do. 6 -	41,657	34	42	11	9	—	3	—	—	20	24	29	2	C. R. M. GREEN, Major, Special Health Officer.
District II.—														
Ward No. 7 -	20,646	14	22	5	8	—	1	1	363	14	14	14	7	
Do. 8 -	50,781	41	56	8	9	—	2	3	423	44	44	40	14	The reported plague cases and the general mortality show an increase on the preceding week.
Do. 9 -	49,472	50	66	11	10	—	2	—	75	50	50	34	21	
Do. 10 -	22,668	16	27	3	3	—	—	4	122	24	24	20	14	J. N. COOK, Health Officer.
Do. 11 -	20,761	17	28	2	2	—	—	—	46	10	10	8	5	The 4th May 1899.
District III.—														
Ward No. 12 -	6,083	2	2	—	—	—	—	—	—	—	—	4	—	
Do. 13 -	28,366	19	33	8	7	—	1	10	51	26	26	23	—	
Do. 14 -	29,207	18	27	4	3	—	1	4	37	22	22	11	—	
Do. 15 -	13,218	11	16	5	4	—	—	2	20	12	12	11	—	
Do. 16 -	4,620	1	2	—	—	—	—	—	4	3	3	—	—	
Do. 17 -	4,598	3	5	2	2	—	—	—	7	2	2	4	—	
Do. 19	4,820	30	22	1	—	—	1	5	12	20	20	7	—	
District IV., West—														
Ward No. 18 -	33,147	6	3	—	—	—	—	—	—	1	1	—	—	
Do. 23 -	23,620	7	8	—	—	—	—	—	—	—	—	—	—	
Do. 24 -	22,831	12	18	1	1	—	1	1	38	12	12	8	—	
Do. 25 -	42,591	12	26	1	1	—	—	1	50	32	32	14	—	
District IV., East—														
Ward No. 20 -	14,804	17	20	—	—	—	—	1	24	11	11	9	—	
Do. 21 -	15,340	18	10	—	—	—	—	—	6	8	8	3	—	
Do. 22 -	26,833	33	34	19	14	—	—	2	32	25	25	25	—	
Total -	649,401	506	614	117	107	—	15	61	1,310	510	449	372	81	

C. R. M. GREEN, Major, I.M.S., Special Health Officer.

J. N. COOK, Health Officer.

W. R. BRIGHT, Chairman.

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on 01 February, 2020